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METHOD FOR PREPARING WATER-PROOF ASPHALT MATERIALS

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ABSTRACT OF THE DISCLOSURE

Granular, powdery and flaky asphalts are used for paving road surfaces, preparing water-proof roofing materials and filling joints between blocks, as well as other uses. This asphalt may be mixed with aggregates at the work site rather than at an asphalt mixing plant.

This invention concerns the use of granular, powdery (i.e. small granules) and flaky asphalt for several different purposes.

In the pending U.S. patent application of Yoshio Ushiku and Hirokazu Saitoh, Ser. No. 148,813, filed June 1, 1971, titled, "Crusher for Tenacious Material Such as Asphalt," there is described an apparatus for obtaining such products as granular asphalt (Example 1). Using this apparatus, asphalt granules of various sizes can be obtained. By subjecting these granules to additional mechanical treatment, it is possible to obtain powdery asphalt, and by rolling the powdery asphalt between a pair of rollers, flaky asphalt can be obtained.

The present invention is based on the use of these granular, powdery and flaky asphalt products in, for example, the construction field.

Thus, in one respect, this invention relates to an easy paving method for roads, bridges, floors, etc., by using a granular, powdery or flaky asphalt material mixed with crushed stone, gravel, sand or other aggregate.

In order to obtain a heated asphalt mixture used for road pavement, etc., the following process has been employed: After the previously melted straight asphalt and the dried crushed stone, gravel, sand or other aggregate are mixed at the specified ratio in the heating mixer, this heated asphalt mixture is carried to the working site for paving with its heat being retained in transit. The process for obtaining the heated asphalt mixture is conducted in an asphalt mixture plant, which consists chiefly of aggregate heating and drying furnace, asphalt melting kiln, melted asphalt storage tank, scales, conveyor, heating mixer, etc. In general, the melted straight asphalt is carried into a storage tank with a large scale heater by means of tank lorries. As its heat must be retained until completion of the paving work, considerable labor and cost are required for exercise of thermal control. In addition, special equipment is required for weighing the melted asphalt, and for supply to the mixer. As a large-scale plant is required for obtaining the heated mixture, movement and laying of the facilities are not easy. Transportation of the heated mixture is limited by traffic conditions. Furthermore, measures must be taken to insure heat retention and to protect against effects of rainfall. At present, with the concern over problems on such environmental pollution hazards as smoke, offensive smell, dust, etc., distance to the working site is also limited. Thus heated asphalt is accompanied by various difficulties and dangers. Especially at low temperatures in cold areas, or in winter, many difficulties must be overcome. Also, conveyance of melted asphalt by tank lorries presents many problems.

In case blown asphalt is mixed with straight asphalt, as may be required for floor pavement of warehouses,

etc., to develop pressure resistance, lump melting kilns must be laid on the working site since it is difficult to carry the blown asphalt by tank lorries. In this connection more equipment, labor and cost are required, and the danger of ignition and firing is increased.

According to the present invention, however, the required asphalt mixture for paving work can be easily obtained, by using any granular, powdery or flaky asphalt, for example, granular, powdery or flaky straight asphalt (straight run asphalt), blown asphalt (oxidized asphalt), rubber asphalt, or mixtures thereof. Thus, any conventional aggregate material, for example, crushed stone, gravel, sand or blended mixtures thereof in specified ratios and quantities, are mixed with the granular, powdery or flaky asphalt material on the working site to obtain the asphalt mixture. In accordance with the desired road width, roll width of roller, pavement thickness and number of layers, mixtures are then laid in the required width, length and thickness. Thereafter, the road is paved using a rolling press of required frequency.

If required or desired, for example, to achieve pressure resistance, a thin film of staight asphalt can be formed on the surfaces of the aggregates by treating the surface previously with cut-back asphalt, or with an asphalt emulsion, in which the straight asphalt has been emulsified and dispersed in water with an emulsifying agent. Alternatively, or in addition to the pretreatment of the aggregates, a filler or compounding agent, e.g. stone dust, mineral dust, synthetic or natural asbestos, fibers, etc., can be mixed with the granular, powdery or flaky asphalt prior to admixture with the aggregates. These pre-treatments serve to promote adhesion between the asphalt and aggregates, and thus results in a more stabilized paving work. For instance, when filler, a type of aggregate suitable for paving work, is mixed with granular, powdery or flaky asphalt prepared from cut-back asphalt and then the filler-asphalt mixture is mixed with the aggregate, e.g. sand and macadam, the filler will be prevented from scattering and sticking to the surfaces of the aggregate and thus will not obstruct adhesion of granular, powdery or flaky asphalt and aggregate.

The surface treatment of aggregate with straight asphalt acts to join closely together the granular, powdery or flaky asphalt material and the aggregate by means of rolling-press work. Therefore, little thickness is required, since the permeation and adhesion are substantial. For instance, when a cation asphalt emulsion or cut-back asphalt, to which a tear prevention agent is added, is blown, and a natural drying or forced hot-air drying operation, if necessary, is conducted, bonding of the materials can be easily achieved.

Sufficient press is required for the paving work. As for the heating, the materials are sufficiently heated by the heating roller that the granular, powdery or flaky asphalt material is softened and fastened. Depending on the working site and conditions, a burner, or burner and roller can be used.

According to this invention, unlike the conventional methods, no tank lorry is required, and large scale machine equipment such as the melting kilns, storage tanks, melted material weighing machines for the melted materials, hot firing furnaces, etc., are not necessary. As a result, plant equipment can be simplified, no large fire is required, production control becomes easy and the number of personnel required can be curtailed.

In addition, various compounding designs can be easily made, and various physical properties required for the pavement material such as the coarseness, fineness, elasticity, water-tightness, corrosion resistance, durability, etc., can be chosen. Mixtures can be jointly used to achieve these desired objects easily. In enhancing the corrosion resistance and non-slip property, for instance, rub-

ber asphalt can be employed as the granular, powdery or flaky asphalt material. In improving the water-tightness, the compounding ratios of these materials can be increased. In increasing the pressure resistance, blown asphalt can be added. Thus, according to the particular object, various materials and their compounding ratios can be thus employed, and the compounded mixture can be easily obtained. Such factors are readily ascertainable by those in the art.

Each asphalt mixture can be weighed and mixed on the working site. The most efficient method, however, is that only the required quantity of each component of the mixture should be weighed previously to effect the desired compounding ratio in compliance with the working conditions, which are then carried to the working site.

When the present method is employed, the efficiency in large-scale pavement work will become evident. Further, the effective and prompt effects in repairing damaged points (cracks, subsidences, etc.) scattered over the road surface, which cause difficulties to motorists, are also apparent.

In a second respect, this invention relates to a method for making water-proof materials such as asphalt roofing, etc., by using the rapid melting property of the granular, powdery or flaky asphalt materials.

In making asphalt roofing, etc., raw paper composed of organic or inorganic fibers have thus far been dipped in melted straight asphalt. After then dipping into melted blown asphalt, the material was passed between heating rolls to remove excess blown asphalt and develop the specified thickness.

Concerning the application of blown asphalt, there is also a method in which the melted blown asphalt flows down at the passage of the material between the heating rolls.

In these methods, a series of large scale equipment for the processes of melting the lumpy asphalt in the melting kilns, maintaining the melt status, carrying through the insulated pipe, etc., is required. It takes considerable time and labor to crush the solid lumpy asphalt into pieces of proper size, if necessary, supply it to the melting kilns, and melt it in a heavy oil burner. Subsequent thermal control is not easy. In case it is further necessary to obtain the melted material continuously, lumpy material must be continuously supplied. As the melted and non-melted materials must co-exist, convection is poor. In this connection, thermal control becomes even more difficult. Substantial fire must be used for the melting process, and there is thus a high danger of ignition. In case large quantities of asphalt are stored, equipment for heating and retaining the heat for a long period of time is required. During storage, the quality of the asphalt changes due to heat deterioration, resulting in, for example, decomposition, polymerization, etc.

Especially with rubber asphalt containing synthetic rubber, the rubber is rapidly decomposed to free the decomposed materials or to greatly reduce the extension rate. In case the thermal control over the melted asphalt is unsatisfactory therefore, not only the quality but also the thickness of the applied layers changes to make it difficult to manufacture homogeneous products.

The method of this invention, which avoids these problems, is characterized by the following: Melting kilns become unnecessary for the major manufacturing processes including melting, transportation, etc., of the asphalt material. Since the weighing and carrying of the granular, powdery or flaky asphalt material is easier than in the case of liquid material, process and equipment can be curtailed, simplified and automatized to manufacture products of better quality more safely.

In making asphalt roofing, when the knitted material, woven fabric, nonwoven fabric, mesh material or other base material is passed between a pair of heating rolls placed horizontally, granular, powdery or flaky asphalt is supplied between each side of the base material and the adjacent roll to simultaneously conduct the melting, impregnation and application processes. This is also the case with asphalt felt, in which raw paper is initially impregnated with straight asphalt.

In case it is necessary to increase the application thickness with blown asphalt, an additional pair or pairs of horizontal heating rolls are laid behind the above-mentioned heating rolls and blown asphalt is applied. Granular, powdery or flaky asphalt material is then supplied to the asphalt roofing, which has already finished the above treatment. When the material is immediately applied to both sides of the paper respectively, or first to the right side, and then to the other side by the rolls in the next step, products of required thickness, and of equal thickness on both sides, can be obtained. When the number of sets of rolls is further increased, thicknesses never before obtainable can be easily obtained.

For use as to the granular, powdery or flaky asphalt materials, straight asphalt, blown asphalt, compound asphalt, gum asphalt, resin-mixed asphalt, or any other asphalt can be chosen, and worked at such temperatures as comply with its properties. With gum asphalt, for example, water-proof material provided with the desirable physical property never obtained in conventional methods, and which prevent thermal cracking, can be easily and continuously manufactured in sequence. Mixtures of granular or powdery materials of different properties, granular, powdery and flaky materials, and flaky materials can also be practically used.

As the heating roll may be of an enclosed heating type, ignition of the asphalt material can be completely prevented. As thermal control is automatized, there is no danger of firing. For the heating roll, two rolls can be used as previously mentioned. Further, more than three rolls can be easily incorporated into the unit, and used at various angles, horizontal and vertical. It is also possible to previously melt the materials in such small-sized melting units as a panel heater, burner, etc., without heating the rolls themselves. After the impregnation of the above base material, sand grains, crushed stone grains, metallic dust, etc., can be applied by spreading on one side of the base material.

As a result of the above, various kinds of water-proof asphalt materials can be easily and quickly obtained at low cost. When granular, powdery or flaky asphalt is thus employed, large-scale plant facilities are unnecessary. In this connection, it is certain that various kinds of products of excellent quality and required physical properties can be manufactured under easy production control in a single equipment.

In yet another respect, this invention relates to a simple and easy filling work of required efficiency for voids, joints, etc., among and between materials used in structures and buildings, e.g. joints of wood block, asphalt block, brick pavement, portland cement, concrete pavement, etc.

Various filling agents have thus far been used to fill the voids of structures and buildings. As for the working processes, various methods have been used. Especially as the asphalt filling agents, two sorts, injection filling agents of irregular form, and mold filling agents, have been used in most cases. They have been solely or jointly used as the shock absorbing or water-proof material for the voids of roads, bridges, revetments, concrete structures, prefabricated buildings, etc. These filling agents have the following object: Cement and concrete should alleviate stress which is generated inside the structure upon expansion and contraction due to water and moisture absorption, change in temperature, etc. Thus they should prevent breakage and make the working surface watertight, and yet maintain its safety and durability.

As the injection filling agents of irregular form, there are straight asphalt, blown asphalt, compound asphalt, etc. In case the elasticity is further required, gum asphalt is used. As all of them are made of lumps, many kilograms each, they must be crushed into small lumps of proper size, fed into the melting kiln and heated to obtain the melted asphalt. In charging the melting kiln with

lumps, enclosed-type kilns with special feed ports are of high cost and not suitable for use at the working site because of the difficulty of their maintenance. Also, since it is troublesome to supply the material by opening and closing the feed port frequently, and since there are difficult points to reach in the work, open-type flat kilns must be generally used, and much time is therefore required. Further, as the injection filling work must be continuously conducted at high speed, large quantities of melted asphalt must be stored. At the melting operation, large lumps of asphalt are fed constantly, and co-exist with the melted material. Consequently, thermal efficiency is low, convection of the asphalt is poor, substantial time is required for exercising thermal control, and there is a danger of ignition from the viewpoint of kiln construction.

At the injection point, ladle- or funnel-type instruments have been used. It is, however, inevitable that the asphalt will stick to the periphery of the void. In case the void-width is small, asphalt often becomes solidified on the sections near the upper layer of the surface at the time of injection. It is therefore very difficult to fill the deep portion of the void fully and compactly. Especially when a smooth mortar finishing is to be given, if specified, after filling the void of cap concrete of the water-proof layer, smoothing mortar cannot be fastened to the concrete surface if the asphalt sticks to the concrete surface around the void. In such a case, peeling-off often occurs which breaks the finished layer.

As molded joint fillers, there are molded board, in which various fibers, mineral powder, cork (dust and grains), gum powder, etc., are heated and mixed into the asphalt, board, on both sides of which asphalt is pasted, and asphalt fiber joint board, which is impregnated with asphalt after working of the vegetable fiber. They are buried into the specified points of the concrete. In order to retain the water-tightness of the upper portion, it is filled with injection filler. It is necessary however that the finishing work requires melted asphalt. It is, therefore, undeniable that this has the same defects as mentioned above with the injection filler of unstable form.

Whatever method may be employed, large asphalt melting kilns must be used, even when the length of the work section is short. In this connection, more material and labor are required for transportation, laying, operation, etc. In addition, substantial time is wasted.

This invention removes the above defects of melted asphalt by using granular, powdery or flaky asphalt, irrespective of grain size. According to this invention, granular, powdery or flaky asphalt is used to fill the void. The required quantity of this asphalt material is fed and gradually pressed into each void by means of a panel heater, etc. Thus the asphalt is fastened to the inside of the void without any void being developed in the asphalt, which is melted quickly. As the portion melted in the void is fully compact, without leaving any void, the entire void becomes water-tight. In addition, no excessive overflow occurs on the upper side of the void. Thus the void filling, in which the finished surface displays a flat appearance, can be conducted simply, easily, quickly and exactly. Also, the filling process can be applied to slant and vertical surfaces. In case the depth of the void is large, the void inside is partially filled several times by means of a proper panel heater. In case elasticity is subsequently required, quick melting is conducted if gum asphalt powed is used. Consequently, there would be no danger of the gum being decomposed by overheating as found in the past, and a void filling provided with rubber elasticity can be easily obtained. On the other hand, cork grains, stone dust, fibrous and other materials can be mixed with the asphalt material. Since the composition of the asphalt mixture is thereby changed during mixing, void filling work of the required composition can be done even by unskilled workers, not being accompanied by physical change.

As an example of a heat source, an electric panel heater has been mentioned above. Further, a holding-up board can be used to prevent the efflux of asphalt material, and heated with a burner using liquid or gas fuel. Accordingly, no large-type melting kilns are required. In thus saving on labor, there is a substantial economical advantage.

It is apparent that the use of granular, powdery or flaky asphalt, or mixtures thereof, in accordance with this invention results in a superior work product obtained under decidedly economic advantages.

Concerning the grain size of the asphalt, the preferred range is from very fine powder to grains of approximately 5 mm. The properties of the straight asphalt, e.g. penetration degree (100 g., 25° C., 5 sec.), softening point (Ring and Ball method) and ductility (Dow's method), equivalent to those defined in ASTM D946–47T, are as follows:

Penetration degree	Softening point, ° C.	Ductility
10–20	>45	>5
20–40	50–65	>50
40–60	45–60	>100
60–80	40–55	>100

The aggregates used may be coarse, e.g. gravel, fine, e.g. river sand and filler, e.g. limestone. In the case of an asphalt concrete surface, the grain size and distribution might be, for example, as follows:

Sieving	Weight percent	
10 mm. pass, 5 mm. stop	20	Macadam (coarse aggregate.)
5 mm. pass 2.5 mm. stop	22	
2.5 mm. pass, 0.6 mm. stop	23	
0.6 mm. pass, 0.3 mm. stop	8	River sand (fine aggregate).
0.3 mm. pass, 0.15 mm. stop	9	
0.15 mm. pass, 0.074 mm. stop	8	
0.074 mm. pass	10	Limestone (filler).

For guss asphalt, the grain size and distribution can be as follows:

Sieving	Weight percent	
10 mm. pass, 5 mm. stop	24	Macadam (coarse aggregate.)
5 mm. pass, 2.5 mm. stop	24	
2.5 mm. pass 0.074 mm. stop	22	River sand (fine aggregate).
0.074 mm. pass	30	Limestone (filler).

In the case asphalts of different quality but same form, for instance, flaky rubberized asphalt and flaky blown asphalt, are mixed, rubber elasticity and ductility can be easily imparted to the blown asphalt. When these materials are previously manufactured and kept in stock, therefore, many kinds of roofings of different quality can be made in small quantities.

In the case of asphalts of the same quality, when two types of asphalt of different form are mixed, melting and permeation speed can be changed. Further, it is known that weather resistance can be greatly improved, when a large quantity of mineral fine grains are mixed in the asphalt. By applying this action, roofing of the following characteristics can be obtained.

When hard grains, wherein large quantities of mineral fine dust are mixed with catalytic blown asphalt of good weather resistance, are mixed in the flaky rubberized asphalt of low viscosity and fluidity at melting to conduct the coating process, flaky grains can be rapidly melted to act as granular binder. Therefore, protective roofing, on whose surface grains of good weather resistance are densely arranged, can be obtained. Because of the good ductility of rubberized asphalt, this can be made into a roll without forming any cracks.

The following examples are presented by way of illustration only, and are not intended to limit the invention.

EXAMPLE 1

This is a method for paving a top surface of 3–4 cm. thickness on top of a road foundation which has been previously cement-stability treated (to a depth of 12 cm. from the top of the gravel layer) on an existing 20 cm. thick gravel road bed.

Rapid curing type RC–1 (rapid curing type-1) cut-back asphalt is spread at the rate of 11 liters/m.^{2} on the road foundation. After drying, it is paved with the paving mixture of aggregate and asphalt indicated in the Table 1 below.

At the work site, macadam, macadam screenings and river sand were charged into the mixer in the proportion indicated in Table 1. Next, powdery asphalt granules were added and mixed. Thus, the limestone which had been previously dispersed in the asphalt was also mixed to make the blending complete.

Next, approximately one-third of the complete paving mixture is spread on top of the road foundation and, while heating with a propane gas flame, it is pressed with about a 6-ton asphalt finisher. This is repeated three times to obtain a 3–4 cm. thick pavement suitable for light traffic roads, sidewalks and school ground surfacting.

TABLE 1

	Size	Blend ratio
Aggregate:		
Macadam	5–2 mm	30%.
Macadam screenings	Sieve (2.5 mm. pass, 0.074 mm. stop).	33%.
River sand	Sieve (2.5 mm. pass, 0.074 mm. stop).	30%
Limestone	Sieve (0.074 mm. pass).	7%.
Paving grade asphalt		8%.
Properties of the paving grade asphalt:		
Penetration degree (25° C., 100 g., 5 sec.).		40–60.
Softening point (ring & ball)		60° C.
Ductility (15° C., Dow's method)		<15.
Size of powdery asphalt granules		Diam. 0.2–2 mm.

EXAMPLE 2

Pre-treatment is effected by spreading RC–1 cut-back asphalt (penetration degree 100) at the rate of approximately 11 liters/m.^{2} on top of a road foundation which has been formed in accordance with the design specifications for 20,000 cars per day automobile traffic.

Next, a 6 mm. thickness coarse graded pavement is laid as indicated in Table 2. Namely, with the exception of the limestone in the aggregate, the designated volumes of macadam and river sand (fine aggregate) are charged into the mixer in accordance with the proportion shown in column (1) of Table 2, and a few percent of RC–1 type cut-back asphalt is added to the aggregate and mixing is carried out to cause the asphalt to adhere to the surface of the aggregates. After the solvent has evaporated, the powdery asphalt granules (paving grade asphalt) indicated in Table 3 are added in the ratio shown, and mixed. Thus, the limestone which has been previously dispersed in the powdery, granular paving asphalt is also added at the same time, which results in a coarse-graded paving mixture having a complete blend as indicated in the tables.

This paving mixture is spread on top of the road foundation in several passes to obtain the total thickness of the pavement desired. The paving mixture is heated with a propane gas flame maintained at an approximate temperature of 160° C. at the tip and pressed with a 15–16 ton roller. RC–1 is spread at the rate of 0.5 l./m.^{2} on top of this 6 cm. coarse-graded pavement and after drying, the fine-graded pavement indicated in column (2) of Table 2 is laid to a thickness of 4 cm. in the same manner as in column (1) to obtain the desired 10 cm. thickness highway pavement.

TABLE 2

Sieve data		(1) Coarse-graded, percent	(2) Fine-graded, percent
Macadam	13 mm. sieve-pass, 10 mm. sieve-stop	10	----
	10 mm. sieve-pass, 5 mm. sieve-stop	30	20
	5 mm. sieve-pass, 2.5 mm. sieve-stop	22	22
River sand	2.5 mm. sieve-pass, 0.6 mm. sieve-stop	15	23
	0.6 mm sieve-pass, 0.3 mm. sieve-stop	6	8
	0.3 mm. sieve-pass, 0.15 mm. sieve-stop	5	9
	0.15 mm. sieve-pass, 0.074 mm. sieve-stop	4	8
Limestone	0.074 mm. sieve pass	8	10

TABLE 3

Paving grade asphalt	Volume added to aggregate of— 6–8%	8–10%
Properties:		
Penetration degree (25° C., 100 g., 5 sec.)	60–80	40–60
Softening point (ring and ball) ° C	40–55	45–60
Ductility (125° C., Dow's method)	>100	>100
Size:		
Flaky, mm	[1] 2–4	----
Powdery granules (diam.) mm		0.5–2

[1] Thickness approx. 0.5 mm.

NOTE.—Limestone has been previously inluded in the powdery granular or flaky asphalt.

EXAMPLE 3

This is related to paving a bridge or highway on girders handling 20,000 cars per day.

RC–1 cut-back asphalt is spread over the precast concrete blocks erected in accordance with the design specifications in the same manner as in Example 2, and after drying, a 5 cm. thick pavement was constructed having non-slip and anti-wear properties by conducting the same operation as indicated in Example 2 in accordance with the blend indicated in column (2) of Table 2.

However, in this case the asphalt to be used is the rubberized asphalt indicated in the Table 4 below.

TABLE 4

Rubberized asphalt (containing 5% synthetic rubber)	
Penetration degree (25° C., 100 g., 5 sec.)	80
Softening point (ring and ball method) ° C	52
Ductility (Dow's method, 10° C.)	>100
Powdery granules (size) containing the designated proportion of limestone (diam.) mm	0.5–2

EXAMPLE 4

This is a method wherein a powdery, granular asphalt is melted and impregnated into a polyester filament non-woven fabric (100 g./m.^{2}, 1.2 mm. thickness), and then a flaky asphalt is melted and coated onto both the top and under surfaces.

A pair of metal rollers with a 30 cm. diameter horizontal electric heater therein is installed with the rollers 1.2 mm. apart. The surface temperature is maintained at 200° C. ±5° C. While the rollers are rotated at a peripheral speed of 2.2 m./min., the polyester base is fed through the rollers at the rate of 2 m./min. At the same time the powdery, granular asphalt from an upper hopper is supplied between the rollers on to both the top and under surfaces of the base to form a suitable

bank between the base and the rollers. Thus, the powdery, granular asphalt in between the rollers and the base which operate at different speeds, as indicated above, is given a rotating motion and at the same time is subjected to frictional effect to further speed the melting of the powdery, granular asphalt, which increases the rate of impregnation into the base. This results in a successful and complete impregnation of the base.

Next, the asphalt impregnated base is subjected to the following coating process. Namely, in the same manner as noted above, the rollers are set approximately 2.2 mm. apart and their surface temperature is maintained at 230° C. The rollers are rotated at a peripheral speed of 2.2 m./min. and the base is fed between the rollers at a speed of 2 m./min., while at the same time from the upper hopper the flaky asphalt is supplied between the rollers on to both the top and under surfaces of the base to form a suitable amount of bank. Thus, an asphalt roofing with an approximate thickness of 2.1 mm. was obtained which has an asphalt coating of approximately 0.5 mm. thickness on the top and under sides.

The properties, size and form of the asphalt used are shown in Table 5 below.

TABLE 5

	Catalytic blown asphalt	
	Powdery	Flaky
Softening point (ring and ball method) ° C	85	105
Penetration (25° C., 100 g., 5 sec.)	45	35
Ductility (0° C.)	2.5	2.0
Size of powdery granules (diam.) mm	0.5–1	
Size of flakes, mm		[1] 2–3

[1] Approx. thickness, 0.5 mm.

EXAMPLE 5

A mixture of powdery and flaky asphalt and granular asphalt which has been heated is used for filling joints between precast concrete blocks, etc., in bulidings to form joints having the characteristics of being waterproof, elasticity and flexibility.

The filler mixturue consists of a mixture of powdery and flaky blown asphalt blended in a weight proportion of 2:3, and to this is further added a rubberized blown asphalt in a volume of 30% (wt.). This mixture is heated and supplied as the filler for the 500 cm. joint sectional form, 2 cm. wide and 3 cm. deep, installed between the vertically erected adjacent precast concrete blocks (the inner wall surface of the joint is initially pretreated and cleaned with a solution of cut-back asphalt diluted with petroleum naphtha). Namely, by utilizing a rod type electric heater with a 10 mm. wide, 7 mm. thick and 50 mm. long heating surface, the previously mentioned filler mixture is gradaually melted and the entire length and depth of the joint is completely sealed in two passes from the flat bottom portion of the joint.

Since the surface temperature of the rod type electric heater is maintained at 160–170° C., the surface of the granular rubberized blown asphalt is softened without pyrolysis of the rubber portion contained therein. The powdery and flaky blown asphalt which comes in contact at the same time with the rod type electric heater is speedily melted due to its form and special characteristics, and adheres to the rubberized blown asphalt. Therefore, the filler mixture is easily and speedily filled into the joint in a laminated condition.

The joint thusly made does not deteriorate and differs from those of the past, which in order to obtain flexible characteristics utilized a cork powder additive which essentially has deteriorative properties. Furthermore, the elasticity and flexibility qualities are permanent because of the inclusion of the above-mentioned granules which have mutual affinity for strong adhesiveness and elasticity, and which together with its essentially waterproof qualities results in durability of the sealed joint being extremely superior.

The characteristics, form and size of the various asphalts which make up the filler mixture is as indicated in Table 6 below.

TABLE 6

	Blown asphalt	Rubberized blown asphalt
Softening point (ring and ball method) ° C	100	115
Penetration degree (25° C., 100 g., 5 sec.)	22	30
Ductility (25° C.)	3	[1] 5
Size:		
Powdery (diam.) mm	0.1–0.3	
Flaky, mm	[2] ca. 3	
Granular (diam.) mm		1–3

[1] Includes 7% synthetic rubber.
[2] Thickness approx. 0.3 mm.

What is claimed is:

1. A method for preparing water-proof asphalt materials which comprises passing a knitted material, woven fabric, non-woven fabric, mesh material or paper as a basic material between a pair of horizontally placed heating rolls while supplying at least one of granular, powdery and flaky asphalts between each side of the base material and the adjacent roll, on the side of the rolls receiving the base material, in a manner which will effect melting and impregnation of the asphalt into the base material.

2. The method according to claim 1 and further comprising passing the impregnated base material through a pair of horizontally placed heating rolls to apply blown asphalt to one side of the base material, and applying at least one of granular, powdery and flaky asphalt to the other side or to both sides of the thus treated base material in the same manner as in claim 1.

3. The method according to claim 1 and further comprising passing the impergnated base material through a pair of horizontally placed heating rolls to apply blown asphalt to both sides of the base material, and applying at least one of granular, powdery and flaky asphalt to the thus treated base material in the same manner as in claim 1.

4. The method according to claim 1 wherein the asphalt is at least one of straight asphalt, blown asphalt, compound asphalt, gum asphalt and resin-mixed asphalt.

5. The method according to claim 1 and further comprising applying sand grains, crushed stone grains or metallic dust to the impregnated base material.

References Cited

UNITED STATES PATENTS

1,925,282	9/1933	Robinson	117—21
3,132,964	5/1964	Young	117—32 X
3,326,366	6/1967	Butterfield et al.	117—32
2,757,100	7/1956	Simril	117—21 X
3,385,722	5/1968	Weaver et al.	117—21
2,926,100	2/1960	Weigle et al.	117—21
2,484,792	10/1949	Mollring	117—21 X
2,978,351	4/1961	Pullar	117—32
2,210,348	8/1940	Swope	117—32 X

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106—273; 117—2 R, 30, 32, 33, 68, 111 R, 168