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PROCESS OF FIBRATING ASPHALT.

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To all whom it may concern:

Be it known that I, ALAN R. LUKENS, a citizen of the United States, and a resident of Wyoming, in the county of Hamilton and State of Ohio, have invented a certain new and useful Process for Fibrating Asphalt, of which the following is a full, clear, and exact description.

My invention relates to improvements over the process developed by James C. Woodley, of incorporating fibers as set forth in his patents, among others United States Patent, No. 1,156,122, dated October 12, 1915. It also relates to an improved product resulting from the process.

In the processes of Woodley, molten asphalt, vegetable fibers, in a wet state, and mineral filler, are kneaded in a mixer similar to a baker's dough mixer, until a plastic or semi-granular state is reached in which the asphalt has so changed that upon ignition of the material, no asphalt will melt out, and in which the fibers are in complete suspension in the asphalt. As described by Woodley, the process results in a product infusible by heat and having the fibers felted together, but each surrounded by the asphalt, said fibers being torn apart by the asphalt and the kneading action until they have been reduced to individual separation.

The difficulty involved in fibrating asphalt with mineral filler to give hardness and other physical properties, according to the method outlined by Woodley, is that the action of the mineral matter, while being kneaded, is to grind up the fibers into very small pieces. When examined under the microscope the fibers of a piece of the Woodley material are in individual condition, but are chopped up into pieces. These pieces are with difficulty visible to the naked eye, although they act to strengthen and toughen the asphalt very considerably, but they do not impart near as much strength as if they were of greater length.

I find that by proceeding in a different way I can still individualize the fibers, thoroughly coat each fiber with asphalt or other bitumens of similar nature, and incorporate into the mix a large quantity of finely divided mineral matter, such as a diatomaceous earth, without breaking up the individual fibers into parts.

Of course, if a mineral matter of non-abrasive nature substantially small in quantities be used in the Woodley process, the reduction of the fibers will not be so great. The real problem comes when it is necessary, because of the uses to which the final material is to be put, to use a substance which has an abrasive quality very strongly marked, or where the mineral matter must be present in a predominating quantity. I use in my process, by preference, a diatomaceous earth.

In processes which involve the steps of first dispersing bitumen in a watery paste of colloidal clay, and then mixing it with fibers, and finally drawing out the water from the clay, and thus reviving the bitumen, the limits as to bituminous content of the final product are quite distinct. Such processes, as used in resin sizing, or asphalt sizing of paper are termed emulsification processes, and not only are much more limited as to result than my process, but in the nature of the action involved, are about the converse of my process.

Furthermore a clay finely divided enough to act as an emulsifying agent is usually not of a character suitable for acid resistance products, so that in range of minerals which may be used, my process is distinct over a fiber sizing process.

Known emulsification processes, while they may be carried on within certain limits, and result in a product which may or may not be similar to the Woodley product, still have very definite limitations in the amount of bitumen which can be incorporated into the product. In fact, in commercial uses of the mulsification process, the usual practice results in a great excess of fibers over bitumen. My process gains the advantages in length of fiber of the emulsifying processes, and still has a body high in bitumen and hard because of the presence of mineral matter, and may have other superior qualtities due to a chance for selection of special minerals for special uses.

Thus, my process and product have advantages not obtainable in any other manner.

The apparatus used with my process consists of mixers, similar to those used by bakers for mixing large batches of bread dough, and sufficient heating devices to maintain asphalt in a molten condition in the presence of water.

The essential feature of my invention is that I mix, a bitumen such as asphalt and mineral or earthy matter in one beater, and the same or a similar bitumen together with fiber in another, and then mix the two resultant bodies together. I find that by properly mixing finely divided mineral or earthy matter and asphalt without emulsification, I obtain a form of suspension in which each particle of finely divided filler is surrounded by a film of asphalt and is thus greatly deprived of its abrasive qualities. Then when both the fiber and filler have been previously coated with bitumen they readily and quickly blend together in a homogeneous mass without such final kneading or mixing, seriously pulverizing, or shortening the fiber. I thus obtain a mass which is stiff and strong yet is not brittle nor fragile.

Proceeding to described a typical commercial use of my invention, I first determine what proportions say of an asphalt, and mineral matter and fiber, which I desire in my final product. I then place in the first mixer the least amount of the asphalt which will properly fully coat and disperse the fiber, which action I have termed fibration, and in another mixer I place the balance of the asphalt to be used for the purpose of thoroughly coating the mineral or earthy matter.

While then maintaining heat under each mixer, into the first mixer I place the desired amounts of fibers which may be in the form of scrap paper in a well moistened condition. As this mixer operates, it first disperses the fiber throughout the mass of asphalt and thereafter evaporates all of the water. Into the second mixer I place the desired quantity of mineral or earthy matter, and operate it to knead up the product. Into the mineral or earthy matter mixer 1 add sufficient water, well short what would be an emulsifying quantity, yet sufficient to break down surface tensions to permit the mineral or earthy filler to enter quickly into full suspension.

As soon as the filler has been uniformly dispersed I permit the water to evaporate as steam, adding no more water. After the water has thus left the mixer and the temperature has raised within the mixer sufficiently to convert the mix into a smooth plastic mass, the action of the mixer is stopped and the contents of the fibrating mixer added.

The fibrating mixer has been operated all of this time, and, as taught by Woodley, the action of the tacky asphalt on the wet paper or fibers will be to tear the fibers up into their original condition, and to break down surface tensions at the same time sufficiently that the fibers enter into suspension in the asphalt, the water not evaporating until this has taken place. The nature of the suspension has been termed "colloidal" by me as the fibers will not separate from the bitumen, when the latter is held in liquid state.

After the mineral or earthy mix is added to the fiber mix, the two require mixing together in the mixer for only a short time, whereupon they quickly come into a homogeneous mix, thereby providing the product desired.

In this product the filler is evenly and minutely distributed, and the fibers are individualized, and the time element is not materially different from the Woodley process, while the fibers are not materially shortened in length having been mixed only for a short time in the presence of the mineral or earthy filler, and the filler being at the time well coated, or "lubricated" with the bitumen used.

As a material for the production of electrolytic jars, which is readily moldable, and has air suspension, sufficient to permit considerable compression in a die, the material produced by my process is very superior. It can be made both hard and tough, the fibers are thoroughly distributed, as is the mineral matter, and the length of the fibers seems to increase their strength in holding the mass together without in any way affecting the colloidal nature of the final material. It may not be precise to designate as "colloidal," the nature of the material wherein it differs over an asphalt which has been filled with other materials, such as fiber and mineral matter, but in which the nature of the asphalt has not undergone a change. This change, as has been stated, is quite evident from the point of view of fusibility, my material being fully as infusible as that of Woodley. By referring to asphalt, diatomaceous earth and paper fiber, I do not wish to limit my claims that follow beyond the usual range of equivalents of such materials, nor do I wish to limit my process to a simultaneous action of two mixers or any special instant for combining the two mixes or the particular manner of combining them or to the necessity of immediately making the final mixes before the first mixes become cold.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. A process of hardening and toughening asphalt or the like bituminous body, which consists in mixing a bitumen and finely divided matter having abrasive qualities, independently thereof, mixing a bitumen and fibrous material, and finally placing the two mixed masses together and mixing them, whereby the abrasive quality of the matter against the fibrous material is reduced in said final mixing.

2. A process of hardening and toughening

asphalt or the like bituminous body, which consists in forming two mixes, by kneading together a bitumen and finely divided matter having abrasive qualities and independently kneading together bitumen and fibrous material in the presence of water and heat, and then evaporating the water and finally mixing the two masses together produced by the independent kneading.

3. A process of hardening and toughening asphalt or the like bituminous body, which consists in forming two mixes by kneading together a bitumen and finely divided abrasive matter, and independently kneading together bitumen and fibrous material in the presence of heat and an agent to first form a film about the fibrous material which film is then replaced by the bitumen, and finally kneading together the mixtures so prepared.

ALAN R. LUKENS.