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PROCESS OF MAKING ASPHALTIC STORAGE BATTERY CASES

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5 Claims. (Cl. 106—23)

This is a division of my copending application, Ser. No. 562,428, filed Sept. 11, 1931, and entitled Asphaltic storage battery cases.

My invention relates to the manufacture of asphaltic storage battery cases which, as regularly made, are formed of a composition of bitumen, preferably an asphaltic blend high in Gilsonite, an acid resistant mineral filler, fibrous or not as desired, and vegetable fibers in an amount preferably not greater than 15%, the said composition being moulded under great pressure in suitable dies. The characteristics of such battery boxes and the functions of the several ingredients therein are known in the art, and need not be specially outlined by me. Reference may be made to Patent No. 1,752,917, to A. R. Lukens.

It is sufficient to point out that in bituminous binders, hardness is usually accompanied by a degree of brittleness, and tends to vary inversely to toughness and resistance to shatter. Hardness in the bitumen at ordinary temperatures makes for stiffness in the box and resistance to distortion at higher temperatures, but is somewhat opposed to the toughness and elasticity which make for resistance to cracking at low temperatures. Different bitumens exhibit different combinations of these qualities, as well as softening points and breadth of plastic ranges between liquid stages and solid stages. It has been the practice in the art in the known way to select and/or blend bitumens to secure an optimum mean between relatively opposed characteristics; and in general, blends of tough, blown asphalts with Gilsonite have been found most suitable. Filler materials have a primary hardening function, though they contribute measurably to tensile strength even when nonfibrous. Fibrous materials contribute primarily to toughness and tensile strength.

For simplicity in disclosure, my invention may be thought of as applied to asphaltic battery box compositions in which the other primary factors have been controlled to give optimum results, i. e. in which a suitable composite bituminous binder has been chosen having appropriate hardness, toughness and resistance to temperature, distortion and shatter, combined with a suitable acid-resistant mineral filler, such as a diatomaceous earth, and reinforced with vegetable fiber, low enough in quantity to give an acid resistant result, and the fibers individualized and advantageously distributed to give the maximum tensile strength derivable from the quantity employed. Such structures have proved adequate commercially, and have been sold in large volume. It will be understood from what has been set forth above that individual physical qualities in such compositions may be varied in known manner; but that this is almost invariably accomplished at the expense of some other desirable physical quality which may be and frequently is of equal importance.

The primary object of my invention is the attainment of enhanced properties in moulding compositions of the character to which my invention is addressed, without the sacrifice of other useful qualities.

More particularly it is an object of my invention to enhance the desirable qualities of the binder materials employed and to achieve greater toughness, tensile strength, resistance to crack and shatter and low-temperature resistance, without at the same time sacrificing high temperature resistance.

These and other objects of my invention which will be pointed out hereinafter or will be apparent to one skilled in the art upon reading these specifications, I accomplish in that composition and by that certain process of which I shall hereinafter describe a preferred embodiment.

Briefly, in the practice of my invention I secure enhanced qualities in the binders of plastic compositions containing bitumens by the addition thereto of certain relatively quite small quantities of rubber. Battery boxes have hitherto been made of rubber, but it is not to these that my invention is addressed. Both new and reclaimed rubbers have been used in battery boxes, and it is common to add to the rubber itself bituminous materials as a diluent. Such bituminous substances have usually been referred to as mineral rubbers and they have been added to and compounded into rubber compositions by the usual rubber technique in amounts up to 34%, or even somewhat greater. The rubber battery box, however, has problems, characteristics and a technique which are peculiar to it, and with which my invention is not concerned.

I have discovered, however, that certain very desirable qualities may be built up in an asphaltic or other bituminous binder by the addition thereto of certain relatively quite small percentages of rubber, without sacrifice of other peculiar and desirable qualities of the bituminous binder, and without stepping over into the rubber box technique. I have found it possible to secure very considerable increases in resistance to temperature change and to shatter, crack and deflection, without the making of the ultimate

mix upon rubber grinding rolls or mixing rolls, and by following the usual technique employed in the manufacture of asphaltic storage battery cases, with the addition of a new ingredient which is a blend of rubber and bitumen, as will hereinafter be more fully set forth. I thus am able to make battery boxes by mixing the composition in a Werner-Pfleiderer or other mixer, with substantially the same time cycle and under the same commercial conditions as have been practiced hitherto in the asphalt battery box art. I am thus involved in no mixing of the complete composition upon grinding rolls, which changes the character thereof and which results in most instances in a type of fiber distribution which would be unsatisfactory for the purposes and under the conditions involved in the manufacture of asphalt storage battery cases. It will be understood that in rubber manufacture not only have the rolls a tendency to grind up vegetable fibers and other filler materials incorporated into the batch, but also that the main strength of the composition comes from the character of the rubber itself. Filler materials in rubber compositions are thus in the nature of diluents having some hardening function, and with rubber battery boxes do not in general exhibit the characteristics of a box in which a binder substance is primarily hardened by a filler and reinforced by a fibrous structure existing as such within the body of the binder. The differences between the rubber technique and the asphalt technique have therefore never been bridged by any intermediate procedure.

My invention is preferably accomplished in following a preferred procedure in which a blend is made of rubber and hydrocarbon as a stock ingredient, and certain percentages of this blend are added to a binder otherwise preferably having the optimum normal characteristics for battery box work, or for the making of other moulding compositions. It may be pointed out that while not restricted thereto, my invention is primarily applicable to battery box manufacture for the reason that the conditions of use of such articles including the requirements of tensile strength and resistance to external conditions, including and modified by the requirements of acid resistance, impose peculiar limitations upon the compound. In ordinary practice, in moulding compositions having plastic binders, it is possible to increase the tensile strength without greatly reducing the hardness of the combined mass by increasing the percentage or relative amount of the fibrous reinforcement therein. This is only possible within certain limits in battery box manufacture for the reason that to increase the amount of vegetable fiber in a battery box composition much beyond 15% will entail an impairment of acid resistance. Vegetable fiber is preferable to most other kinds of fiber by reason of its relative length and the fact that under proper mixing conditions its fibre length is more perfectly preserved in the mixing operation. Since vegetable fiber is not acid-resistant, and since its quantity is therefore relatively strictly limited, not only is it impracticable to employ an increased quantity of said fiber to gain greater strength, but it becomes of vital importance to realize from the permissible quantity all of the reinforcing value of which the material is capable. As a consequence, it is not only extremely important to secure an advantageous type of fiber individualization and distribution as set forth in the patent referred to, but also to avoid in the mixing or incorporating process steps or mechanical manipulations which would tend completely to destroy fiber length, or would tend to produce a fiber distribution of unhomogeneous character.

In an exemplary practice, in accordance with my invention, I may mix 50% or thereabouts of hard-blown asphalt, preferably having a melting or softening point in the neighborhood of 300° F., with 50% or thereabouts of rubber. Reclaimed rubber is entirely satisfactory and is generally preferred for economical reasons, as well as for its mixing properties. Crude or new rubber may also be used, however, and the choice of different types of rubber may be determined in part at least by the respective costs thereof. I prefer to compound the rubber and the asphalt thoroughly on hot rubber mixing or grinding rolls, or in one of the pressure mixers, such as the Banbury, in which very intense mechanical action may be had. The exact quantities of materials in this blend may be varied to suit requirements, as may also their individual characteristics. My object in this step is to provide a material, bearing rubber, which may be added as such to the ordinary binder employed in the manufacture of battery boxes or similar articles, or to the mixer in which a battery box composition is being made, without a change in the general technique. It would doubtless be possible to carry on the entire compounding and mixing operations upon grinding or mixing rolls, including the fabrication of the compound itself, but this, for reasons given hereinabove, is not to be preferred. It should also be pointed out that I add to a bituminous binder a relatively quite small percentage of rubber, and aside from the other advantages of my procedure as outlined, I find that this relatively small quantity of rubber may be distributed completely and homogeneously in a much larger quantity of asphaltic binder with greater ease and in a much shorter time by the process outlined herein.

In the manufacture of a battery case, I may and ordinarily I do substitute 10% of the blend of rubber and bitumen just described for 10% of the binder. The rubber and asphalt combination blends in very well with the remainder of the binder. It will usually be added to the other binder in the mixer or mixers employed, and it may be added while either or both of the binder increments are liquid or not, as desired. At the same temperatures the addition of my rubber blend to an asphaltic binder gives a measurably stiffer combined binder, and subsequently a stiffer composition in the mixing operation. This may increase the time cycle of mixing by a relatively short period; and in some instances the worker may prefer to employ, instead of the ordinary dough mixer device, a mixer having a more intense mechanical action whereby the time cycle may be shorter. This, however, is not necessary and exactly the same technique may be employed with my new composition as has hitherto been employed with asphaltic moulding compositions.

The moulded boxes made of my composition are considerably tougher than battery boxes heretofore made and show a better shatter test and a high pendulum crack, with no sacrifice of the stiffness of the box. As a basis of standard comparison, it may be said that a battery box in which 10% of the regular binder has been displaced by 10% of my rubber blend, will show markedly superior properties as outlined over a battery box

containing the standard binder alone. Contrary to what may be expected, accelerated acid resistance tests upon my new box do not appear to show any very marked improvement, but are not inferior in this respect to the standard box.

Beneficial results can be obtained with as little as 5% of the rubber asphalt blend, and as high as 15 or 20% can be used without changing the general technique. I have found, however, that 10% is the most practical proportion in commercial practice and appears to give about the best results. It is not advantageous to add too much of the rubber blend because, although by the process outlined I have provided a novel and very advantageous way of incorporating relatively small amounts of rubber into bituminous binders, yet the addition of too much rubber tends to make the composition too stiff to be worked in the ordinary mixer without apparently providing any substantial offsetting advantages in enhanced qualities of the composition. I have discovered that the qualities of bituminous binders may be greatly enhanced by the addition of a relatively small amount of rubber, providing the other physical and chemical characteristics of the box, such as the kind of fiber and the character of distribution thereof, remain substantially the same. To employ a different technique, resulting in a different and less advantageous distribution of fibers for example, will not be compensated for by the addition of rubber to the composition, unless one is working with compositions which consist principally of rubber, and which are essentially in a different field. So far as I can determine, there is no commercial middle ground.

As an example of a specific formula (but of course without limitation) I have employed a bituminous binder comprising 35% Stanolite asphalt, 30% Cuban Gilsonite, and 35% Stanolind asphalt, which blended together gives me a binder having a softening point at 240° F., and a penetration of 13 at 150° F. I have employed a rubber asphalt blend containing 50% Korite asphalt having a softening point of 314° F. and 50% of reclaimed rubber. I have made a battery box composition employing 48% of the said bituminous binder, 10% of the said asphalt rubber blend, 30% of diatomaceous earth such as celite, and 12% of vegetable fiber such as cotton linters. Representative boxes moulded from this composition have exhibited an average tensile strength of 1025 lbs. per square inch, and considerably enhanced values upon the regular bar shatter, side and end deflection, and pendulum crack tests upon the sides and ends and resistance to temperature changes.

Modifications may be made in my invention without departing from the spirit thereof.

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

1. A process of making a moulding composition which comprises blending rubber with bituminous material on grinding rolls, and combining a relatively small quantity of the blend so produced with a relatively larger quantity of a bituminous binder substance and incorporating into the combined binder so produced filler and fiber materials by operations not materially damaging the fibers.

2. A process of manufacturing asphaltic compositions which comprises blending asphalt with rubber on grinding rolls, incorporating a relatively small quantity of the blend so produced with a relatively much larger quantity of bituminous binder substance in a mixing device, and incorporating therein filler and fibrous materials to the extent of individualizing said fibrous materials, coating the individual fibers and distributing said fibers homogeneously in the mixed mass by operations not materially damaging the fibers.

3. A process of producing a moulding composition which comprises blending rubber with blown asphalt and mixing a relatively small quantity of the blend thus formed with a relatively larger quantity of a bituminous substance containing Gilsonite and incorporating into the mixed mass filler materials.

4. A process of producing a moulding composition which comprises blending rubber with bitumen and mixing a relatively small quantity of the blend thus formed with a larger quantity of a bituminous substance and incorporating into the mixed mass filler materials.

5. A process of manufacturing moulding compositions which comprises incorporating rubber and asphalt on rubber grinding rolls, introducing a quantity of bituminous binder in substantially liquid state into a mixing machine, adding thereto a relatively much smaller quantity of the rubber and asphalt blend, incorporating said materials in said mixer, and during said incorporation adding and incorporating filler materials therein.

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