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MANUFACTURE OF MOLDED ARTICLES

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My invention is addressed particularly to the art of making molded products from bituminous compositions, which are in general compositions formed of a bituminous binder such as coal tar pitch or asphalt or the like, a quantity of mineral filler of non-fibrous nature, and a quantity of fibrous material such as asbestos, cotton, cellulose, etc.

My invention, while applicable to other types of compositions, is particularly useful in the type of composition in which the mixing process results in the formation of a fibrous plastic dough-like mass, which is the form of the material transferred to the molds. This is to say my invention has particular application to the type of composition in which the binder is sufficient in amount to contain the filler materials, so that a distribution thereof throughout the body of the binder is the function of the mixing operation, the whole mass being plasticized by heat and then cold molded.

Many factors exert an influence upon the finish of articles thus molded. Some compositions are capable of acquiring and retaining a smoother surface or a somewhat higher polish than other compositions. Certain molding processes result in higher finishes; and a more polished mold surface will result, under proper composition and pressure conditions, in the production of a more polished surface on the article.

However, in general, fibrous compositions of this character, particularly where the amount of fibrous ingredient or the amount of non-fibrous filler or both is comparatively large, are not of themselves capable of receiving the highest possible finishes in ordinary molding operations, even with highly finished molds. The chief expedient employed by the prior art to overcome this has been to include within the body of the composition a glossing material which will tend to produce a higher finish. Such materials are ordinarily the waxes of which there are a number of suitable ones, such as Montan, Carnauba and the like.

Thus a few per cent by weight of Montan wax added to a bituminous binder will give a compound capable of being formed up in a polished mold under pressure with a high luster. Where the physical qualities of the mix, however, are of importance, and where it is the manufacturer's purpose to obtain all of the stiffness, rigidity and resistance to deflecting stresses under heat of which the material is capable, combined with the utmost toughness and tensile strength obtainable from the fibrous ingredient, the desirable physical qualities are considerably impaired by the inclusion of foreign substances. In the manufacture of automotive storage battery cases, as an example, with a given formula that of itself produces a satisfactory case, the inclusion of a few per cent of Montan as above outlined, while producing a better looking box, nevertheless so weakens the resistance of the structure to distortion under heat as to impair the usability of the box unless other means are taken to restore the desired qualities. The effect of the addition of the wax is to give to the combined binder a softer condition when heated. The wax usually also changes the susceptibility factor of the binder and may possibly have a detrimental effect upon the mixing.

This method of obtaining high glossed articles, therefore, while satisfactory for articles where physical qualities of a high order are not necessary, is unsuitable for many uses, and in any event represents some addition to the cost of the ingredients. Nevertheless, it has hitherto been the only generally practiced method of securing high glossed articles, excepting of course, the production of highly finished articles, by subsequent surface treatments, lacquering or coating.

It is the object of my invention to give to ordinary fibrous plastic compositions of heated plastic base, without the addition of foreign ingredients, qualities which enable them to form up in the molds with very highly glossed surfaces. I accomplish my object by that process which I shall now fully describe in connection with compositions made of an asphaltic base and filler materials, it being understood that my invention is applicable to other types of compositions and other mixing methods than the one which I shall describe as preferable.

I first effect a distribution of my filler materials, i. e., fibrous and non-fibrous fillers, either alone or together, throughout a body of the binder. In distributing my fiber throughout a binder, I prefer to follow the procedure outlined in the Patent No. 1,156,122 to James C. Woodley, which comprises bringing the binder under the influence of heat to a gummy consistency in which it is adhesive to the fibrous materials and more extensible than they, bringing the fibrous aggregates into intimate adhering contact with the binder in this condition, and then by repeatedly extending the mass, bringing about a reduction of the fibrous aggregates to individualized fibers and concurrently a distribution of these fibers throughout the bituminous body, a coating of them therewith, and a refelting of them therein,

to the extent of producing a fibrous biuminous mass in which the individuality of the original fibrous aggregates has been completely lost. My invention is, however, applicable to other types of mix.

I do this, as explained, with a desired quantity of bitumen, and I may at the same time combine therewith the mineral filler which I use, if any, or I may prefer to combine this mineral filler separately with a separate portion of the same binder and then mix the two together, which is the process described in Patent No. 1,156,703, to A. R. Lukens. Thus in following my invention I form a finished mixture with a certain quantity of binder which I intend the ultimate composition to have as a whole, and I retain a separate quantity of the same binder in a heated and liquid condition until my mixture is otherwise finished and in a condition for molding articles; then I add this extra binder as a liquid to the mixer and continue the mixing operation for a short period, whereupon I mold. The amount of separate binder added thus in a liquid condition, I find in practice to be preferably about 4% by weight of the finished composition, or less.

If the mix is of the proper proportions and has been made as described in accordance with the teachings of the Woodley patent, when finished and before the addition of the extra binder, it will be in a stiffly plastic state having considerable body and riding low on the mixer blades. The extra binder, being liquid, will be in quite a different condition from the binder in the preformed mix, and a new action will result. The continued rotation of the mixer blades in the presence of the liquefied bitumen will cause a breaking up of the preformed binder into balls or smaller aggregates, the size of which can with more or less definiteness be controlled by controlling the mixing operation. A shorter operation will give larger aggregates and a longer one, smaller and smaller aggregates. Continual mixing will cause the formation of a new homogeneous compound, which I do not desire, and I stop the mixing short of that point. During this mixing, the temperature of the compound is generally held so as to retain it in the gummy state, i. e., the temperature is not allowed to rise to the point of liquefying the binder in the body of the composition.

The mixing is preferably watched and continued until the aggregates are of about the proper size for single charges in the mold, and the effect of my process is to produce aggregates of heavy composition with a thin layer of clear binder in superficial association therewith, that is to say, binder free from fiber or filler. When such coated aggregates are placed in a polished warm mold and molded under pressure a highly finished article results. This will be primarily due to the production of a surface on the article which, though having little thickness, is of clear bitumen as distinguished from bitumen and fiber or filler.

I find that by this process I can get results comparable, if not superior to the results obtained by using glossing substances in the composition itself, and I get away entirely from the disadvantage of changing the binder through the addition of foreign substances. Indeed my investigations have so far shown that the tensile strength, deflection and the like valuable characteristics of the compound are not essentially altered by my practice. My process results in the molding essentially of a fibrous bituminous body with a superficial coating of polished bitumen.

While I prefer to practice the extra mixing with the added liquefied binder until I obtain coated aggregates of approximately the proper size for molding, I find that absolute control is not necessary here and that in molding operations, particularly in molds having what is known as a long draw, I may form perfectly satisfactory articles out of more than a single coated aggregate.

Since the amount of added liquefied bitumen is in any event small, I explain this peculiar result by assuming that the distortion of the material during the molding process, i. e., the flow of the material in the long draw, serves to homogenize it by bringing about either a mechanical blending or a displacement of the superadded asphalt; and the composition itself becomes homogeneous where adjacent aggregates come together. This action does not occur at the mold surface, which is the place where I desire a polish; and if the mold surface is properly designed and polished, a sliding motion of the material there-along occurs which preserves the superficial asphaltic coating and gives me the desired article. I thus obtain essentially the same result that I obtain with a single aggregate, namely, a homogeneous molded compound with a superficial polished coating of the bitumen, and I find that I do not obtain, as might otherwise be expected, a non-homogeneous massing of unrelated aggregates in the mold with clear asphalt therebetween.

I find also that my process remarkably increases the acid resistance of compounds containing non-acid-resistant fibrous or mineral fillers by sealing these substances with a coating of bitumen against the acid. This characteristic of my process is very valuable in the manufacture of many articles such as cell covers for storage battery boxes and the like.

Excepting for considerations of operating economy, I might, of course, achieve the same result by mixing up a compound for molding, weighing out a mold charge in a lump and then dipping this mold charge into a bath of liquid asphalt so as to thinly coat it therewith, thereupon molding as in ordinary practice. My investigations have shown that this produces the same result; but the process I have above outlined secures it in a commercial way cheaply and on a large scale.

I could also achieve a similar result by taking a weighed molding charge, covering the surface thereof with powdered asphalt, and molding the charge under such a heat as would plasticize the powdered asphalt against the mold wall. These variations may be useful in the making of certain articles, although my work has been primarily attuned to the commercial manufacture of such articles as storage battery cases or covers therefor on a large scale. Various modifications of my invention may be made by the person skilled in the art without departing from the spirit of it.

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

1. A process of manufacturing molded articles with a high surface finish from plastic compositions comprising a binder and filler materials, which consists in making a mix of binder and filler materials suitable for the molding operation and, before introducing said composition into the molds, mixing therewith a quantity of clear binder so as to produce and coat aggregates of the composition therewith, and molding articles from said aggregates.

2. A process of manufacturing molded articles with a high surface finish from plastic compositions comprising a binder and filler materials, which consists in making a mix of binder and filler materials suitable for the molding operation and, before introducing said composition into the molds, mixing therewith a quantity of clear binder so as to produce and coat aggregates of the composition therewith, and molding articles from said aggregates, said molding operation being carried on in a polished mold.

3. A process of forming molded articles from fibrous bituminous compositions which comprises making a mix of bituminous binder and the desired fibrous material, while retaining out of said mix a portion of said binder, adding said retained portion of binder to the mixer when the preformed mix therein is in a plastic state suitable for molding, continuing the mixing operation until said mix is reduced to aggregates coated with the clear binder, and molding articles from said aggregates in a polished mold.

4. That process of producing molded articles which comprises making a mix of a binder and filler materials, one of which at least is fibrous, carrying the mixing operation to completion and thereupon adding to the mixed mass a further quantity of binder in liquid form and continuing the mixing operation until the preformed mix has been reduced to aggregates approximately of the size to form a mold charge, said aggregates by this process becoming associated superficially with said super-added binder, transferring a coated aggregate as a mold charge into a mold with a surface finish and molding said aggregate therein under pressure, whereby a superficial coating of clear binder is molded against the mold walls.

5. That process of producing highly finished molded articles which comprises making a mix of bituminous binder and filler materials, one of which at least is fibrous, while retaining out of said mix a portion of the said binder, continuing the mixing operation until the mixed mass is plastic and suitable for molding, adding the retained binder in liquid form to said mixed mass, and containing the mixing operation until said mixed mass is reduced to coated aggregates of convenient size for molding, transferring said coated aggregates to molds and molding articles therefrom under pressure.

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