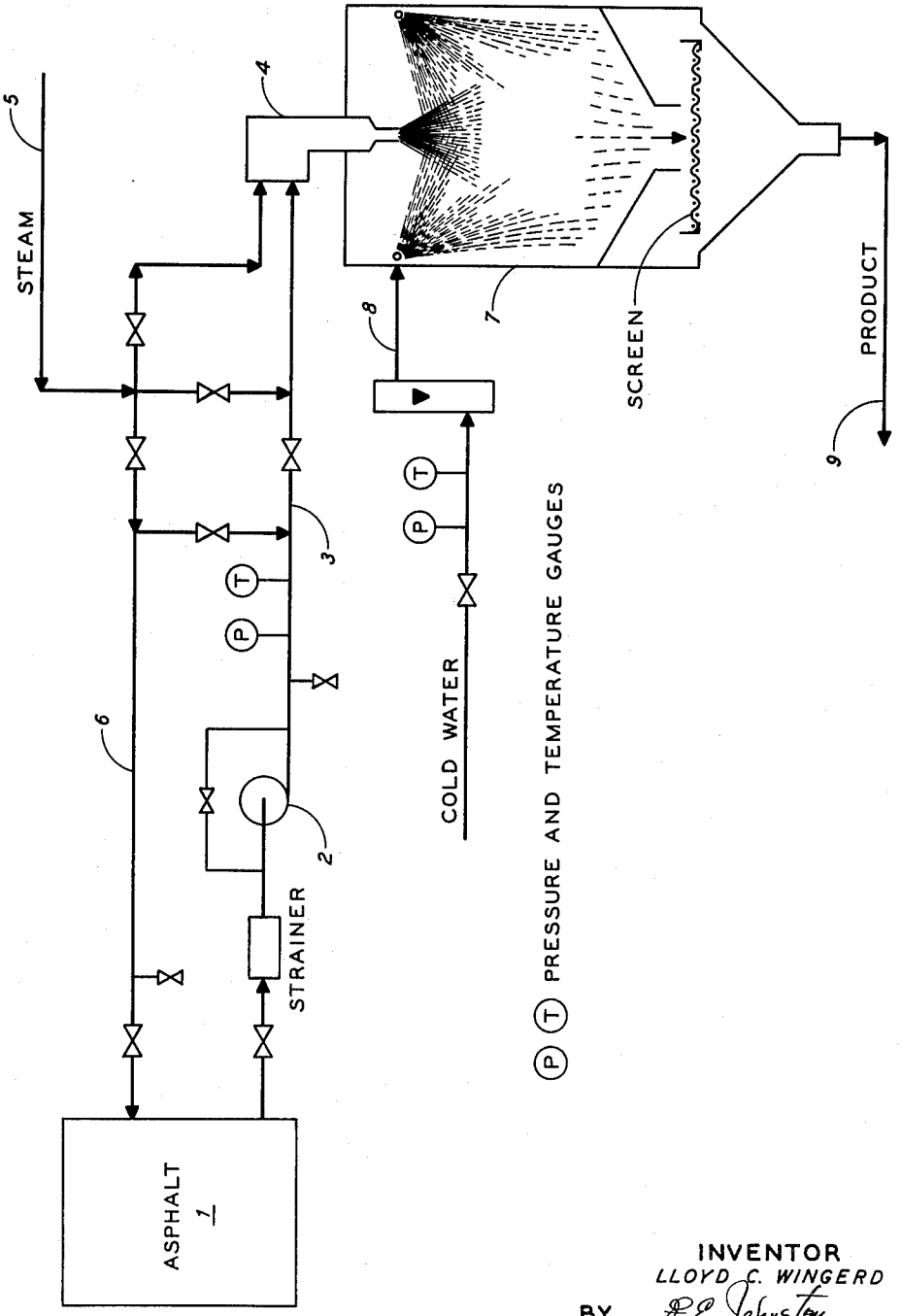
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PROCESS FOR ATOMIZING ASPHALT

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PROCESS FOR ATOMIZING ASPHALT

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The present invention relates to a process for producing aqueous suspensions of atomized asphalt. More particularly it relates to a process for producing aqueous suspensions of atomized asphalts characterized by penetrations not exceeding 16 at 130° F. (100 gram load; 5 seconds), and by viscosities not exceeding 400 and preferably 300 or less centistokes at 450° F., these suspensions being eminently suitable for use in the manufacture of structural board.

The term "structural board" as employed in the art of pulp and paper making refers to a board manufactured principally from wood, cane, licorice root, and other vegetable fibers by a felting or molding process, in which a suitable sizing agent is added to the fiber material to render the board water resistant. In addition, this board may possess structural, thermal, insulating and sound-deadening properties.

The harder varieties of asphalt, when reduced to a suitably small particle size, thoroughly dispersed within the pulp (wood, cane, etc.), and precipitated onto the cellulose fibers of this pulp with papermaker's alum or an equivalent flocculating material, act as excellent internal sizing agents which prevent moisture pick-up and add strength to the board.

The heretofore proposed methods for the reduction of hard asphalts to particles of a size convenient for crushing or grinding them further to even smaller pulverized particles, which would pass substantially completely (not less than 94–95%) through a 40-mesh sieve but would be retained on a 300 mesh sieve, are onerous and expensive. The additional crushing or grinding of the reduced asphalt particles is likewise expensive on account of the power requirements.

The process of the present invention provides a simple, economical means for converting harder varieties of asphalt to a convenient, comminuted atomized form, readily suspendible in water and suitable for incorporation and intimate distribution as an internal sizing in cellulose pulp stocks intended for the manufacture of structural board. A particularly valuable and novel feature of the asphalt reduced and suspended in water in accordance with this process is the practically non-existent tendency of the asphalt particles to coalesce upon storage of the resulting suspensions or slurries of the atomized asphalt. So long as the penetration of the ashpalt, measured by the penetrometer method at 130° F. with a 100 gram load in 5 seconds, does not exceed 16, and so long as the viscosity of the asphalt does not exceed 400 and preferably 300 centistokes or less at 450° F., it can be converted by a sequence of steps of melting hard asphalt, atomizing the melted material and contacting the atomized spray with a shower of cold water to the form of aqueous suspensions, in which the particles of atomized asphalt will not coalesce under ordinary conditions, which will be readily miscible with the pulp stock and which, used as a sizing in the manufacture of structural board, will provide superior moisture resistance and greater structural strength to the board that will have an appearance satisfying the requirements of the trade. As much as 20 to 30% by weight of asphaltic solids can be thus introduced into the board.

In addition to the criticality of the penetration property and to the preferred viscosity not exceeding 400 and preferably 300 centistokes or less at 450° F., the asphalt must be free from offensive odor and smoke at atomizing temperatures, and must not have a flash point below about 500° F. (Cleveland Open Cup).

According to the process of the invention the ashpalt is loaded in any available shape and size into a kettle or melting pot, heated to a temperature from about 425 to about 550° F. The melted asphalt is then directed to an atomizing pressure nozzle device operated with the aid of superheated steam, air, or an inert gas. Any known efficient atomizing nozzle, e.g., a hollow-cone nozzle or a rotary-disc nozzle, may be employed. The melted fluid asphalt is atomized through the nozzle into a collecting chamber. The atomizing temperatures for the production of a satisfactory spray of atomized asphalt must be in the range of 425 to 550° F. and preferably from about 450 to about 500° F., while the operative atomizing pressures range upwards from about 50 p.s.i.g. In the collecting chamber, the asphalt spray meets a shower of cold water and is chilled thereby to a temperature less than about 140° F. The shower of water issues from a sparger-like arrangement with orifices opening on the inside of the collecting chamber. A suspension (slurry) of atomized asphalt particles results and is collected at the bottom of the chamber. This suspension is fed directly or through a 40-mesh screen (to catch those asphalt particles, if any, which do not pass through such a screen) to stock chests containing the pulp which will be processed into structural board. If necessary, the suspension may first be sent to an intermediate storage tank or receiver. The stock chests are provided with suitable stirring mechanisms, and there the asphalt slurry is thoroughly distributed in the pulp.

Papermaker's alum or an equivalent flocculating agent is added to the mixture of pulp and asphalt slurry to insure adhesion of the asphalt to the fibers of the pulp. A small quantity of a material acting as a wetting agent, for instance, of an emulsified asphalt composition known in commerce under the trademark designation "Bitusize BB," may be used with the slurry of atomized asphalt to facilitate dispersion and to prevent agglomeration of the particles of asphalt. This emulsified asphalt usually will be used in quantities that range from about 1 to about 10% of the dry fiber weight of the finished structural board. The emulsion is either added to the asphalt slurry in the collecting chamber or on leaving it or to the mixture of the pulp and asphalt in the stock chest.

The operation of the process for preparing aqueous dispersions or slurries of atomized asphalt (at least 94–95% passing through a 40-mesh screen) will be more readily understood by reference to the attached drawing which shows a simplified flow diagram of the process. In the drawing, solid hard asphalt characterized by a penetration not exceeding the critical maximum penetration and having the desired viscosity is melted in kettle **1** heated to a temperature in the range from 425° F. to 450° F. From the kettle, the melted asphalt is pumped with the aid of pump **2** via line **3** into a pressure-nozzle device **4**. Superheated steam or air under adequate pressure is applied through line **5**. Line **6** is used to recirculate the hot asphalt in the system in order to get all lines hot and the asphalt flowing freely, before starting the atomization. This line also provides a means for cleaning the asphalt lines by blowing them out with steam. Water for chilling the asphalt and for forming the slurry therewith arrives at collecting chamber **7** through line **8**. The slurry of atomized asphalt is withdrawn from the collecting chamber through line **9** either to storage or to stock chests.

Subsequent application of aqueous suspensions of atomized asphalt, prepared in accordance with the invention, as a sizing material to be used in the processing of pulp stocks to structural board can be carried out in ac-

cordance with conventional methods employed in the pulp mills which manufacture paper and paperboard. On admixture of the suspension of atomized asphalt and after the distribution of the asphalt, and also of other additives which may be required, throughout the pulp in the stock chests, the mixture is sent to a head box and thence to wire screens (fourdriniers) where the water content of the puly is first reduced by gravity flow and then to suction boxes where it is further reduced by suction Thereupon, the substantially dehydrated pulp on the wire screens is sent to the pressure rolls to remove further residual moisture and to compress the pulp to a board of the desired form and size between conventional sets of pressure screens and formation screens. The resulting shaped board is next sent via a conveyor to be cut to the desired dimensions. After the cutting, the board is subjected to a final drying and is finally trimmed to conform with specified dimensions.

Of course, the wire-screen processing is but one of the several ways in which one may produce board sized with the aid of suspensions of atomized asphalt prepared in accordance with the process of the present invention. Other processing techniques, such as formation of the board on cylinder machines may be also employed.

In a typical example, an aqueous suspension of atomized asphalt is prepared by the aforedescribed process using an asphalt characterized by penetration values of 8 at 100° F., 12 at 115° F., and of a maximum of 16 at 130° F., as indicated by the distance to which a 100-gram penetrometer needle sinks into the asphalt sample in 5 seconds. The asphalt in this example has a flash point above 500° F. and, when heated to 450° F., does not emit any offensive odor or smoke. The viscosity of this asphalt at the atomizing temperature in the range of 450–480° F. is less than 100 centistokes. Less than 5% of this atomized asphalt is retained on a 40-mesh screen. When the suspension of this asphalt is used for sizing a stock of wood pulp, the structural board ultimately produced as described hereinbefore is of a uniform, substantially spotless appearance. It is water-resistant and has a satisfactory density, good tensile and flexural strengths and a good nail-holding property Equally satisfactory board is obtained with asphalt characterized by penetration values of zero at 100° F., 1 at 115° F. and 2 at 130° F.

When using a suspension of atomized asphalt characterized by the same critical pentration and by a viscosity of about 300 centistokes at an atomizing temperature of about 450° F. and a nozzle pressure of about 80 p.s.i.g., the finally produced board appeared to be somewhat mottled, but nevertheless acceptable in appearance, and was entirely satisfactory as to its strength, water-resistance and nail-holding property.

Contrary thereto, when asphalt, having a penetration in excess of 16 at 130° F., and a viscosity of considerably above 300 centistokes, namely 500 centistokes, was treated in accordance with the process of the invention, at the same atomizing temperature and pressure, 20% of the atomized asphalt was retained on the 40-mesh screen, all of the asphalt passing through a 10-mesh screen. The finally produced board had an unsightly, spotty, discontinuous appearance, rendering it unacceptable as a structural board for the purpose of the industry.

While the above description and the illustrative examples given therein referred to a process of converting hard asphalts of a particular critical range of penetrations,

the process is equally applicable to the preparation of aqueous suspensions of other equivalent thermoplastic materials of comparable penetration and which do not coalesce on being atomized, for instance, coal-tar pitch, resins, and the like. The aqueous suspensions of these equivalent materials can be similarly used as internal sizing agents in the manufacture of structural board and in any other appropriate industrial applications.

It is thus apparent from the foregoing description of the invention that a new, straightforward process is provided for converting bulk hard asphalt to the form of an aqueous suspension of atomized asphalt particles which do not coalesce on storing the suspension and which can be readily and uniformly incorporated and distributed in different pulp stocks to as high a content of asphaltic solids as 20 to 30% by weight to strengthen and improve the properties of the structural board manufactured therefrom.

I claim:

1. A process for the preparation of aqueous suspensions of atomized asphalt suitable for direct use in the manufacture of structural board, said process comprising: heating to a temperature in the range of 425–550° F. a hard asphalt characterized by being free from offensive odor and smoke and having a flash point below about 500° F. (Cleveland Open Cup), a penetration not exceeding 16 at 130° F., as measured with a 100-gram load in 5 seconds, and a viscosity not exceeding 400 centistokes at 450° F.; spraying the melted asphalt through an atomizing device at a temperature between about 425 and 550° F. and under a pressure above about 50 p.s.i.g. to subdivide said asphalt into particles passing substantially completely at least 94% through a 40-mesh sieve; and chilling the atomized asphalt with a shower of water to a temperature less than about 140° F. to form a liquid suspension of non-coalescent particles of asphalt in water.

2. A process for the preparation of aqueous suspensions of atomized asphalt suitable for direct use in the manufacture of structural board, said process comprising: heating to a temperature in the range of 450–500° F. a hard asphalt characterized by being free from offensive odor and smoke and having a flash point below about 500° F. (Cleveland Open Cup), a penetration not exceeding 16 at 130° F., as measured with a 100-gram load in 5 seconds, and a viscosity not exceeding 300 centistokes at 450° F.; spraying the melted asphalt through an atomizing device at a temperature between about 425 and 550° F. and under a pressure above about 50 p.s.i.g. to subdivide said asphalt into particles passing substantially completely at least 94% through a 40-mesh sieve; and chilling the atomized asphalt with a shower of water to a temperature less than about 140° F. to form a liquid suspension of non-coalescent particles of asphalt in water.

References Cited by the Examiner

UNITED STATES PATENTS

1,925,584 9/33 Fisher ..... 252—311.5

FOREIGN PATENTS

257,274 6/27 Great Britain.
379,710 9/32 Great Britain

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