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2,631,946

PROCESS FOR MAKING ASPHALT IMPREGNATED FLOOR COVERING

Filed Sept. 16, 1948

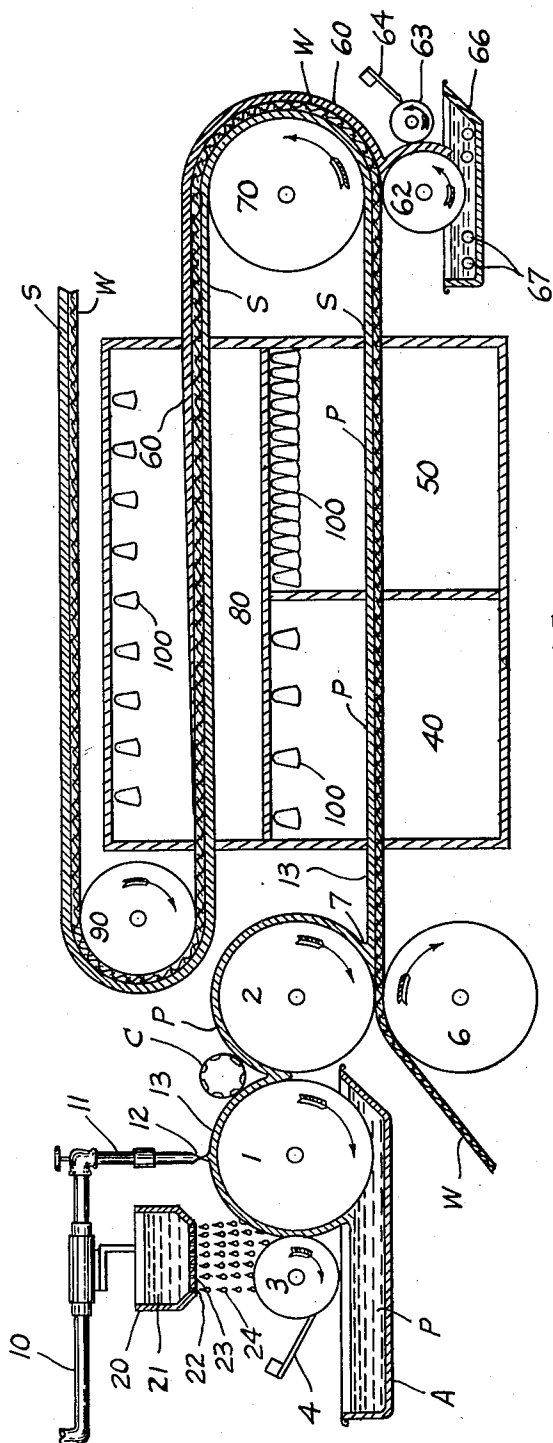


Fig. 1

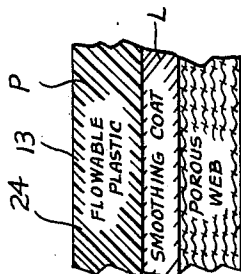


Fig. 2

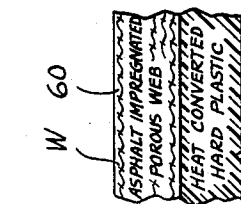


Fig. 3

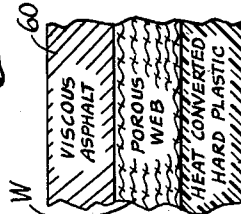


Fig. 4

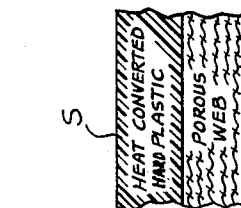


Fig. 5

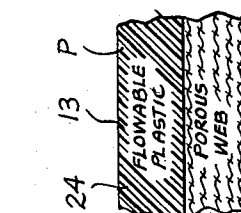


Fig. 6

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PROCESS FOR MAKING ASPHALT IMPREG-
NATED FLOOR COVERINGFred C. Schueler, Fulton, N. Y., assignor to The
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6 Claims. (Cl. 117-45)

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This invention relates to the production of floor covering or the like having an upper layer of plastic and a lower layer of asphalt-impregnated backing material.

By the term plastic, I mean organic chemical compounds of synthetic origin, flowable at certain temperatures and hard at other temperatures, and which at some stage of production are subjected to high temperatures for evaporating solvents, curing or setting the plastic into its final hardened state. Hereinafter I use the terms "flowable plastic" or "heat convertible synthetic resins" to mean such plastic when in a viscous flowable state.

In the floor covering industry the backing material most used consists of mixtures of fibres felted into an absorbent web such as paper. Synthetic fibres, vegetable fibres, or animal fibres such as wool, may be used as a backing web in my invention so long as the resultant web is capable of being impregnated with asphalt to the desired degree.

Felted webs made on paper machinery usually have a substantially smooth surface on one side, often however bearing the marks of the Fourdrinier or cylinder wires upon which is rested. The opposite side of the web which has not been in contact with the wire screen is usually comparatively rough and not suitable for receiving a thin plastic film or layer. I use the terms backing material, backing web, backing and web to mean a strip comprising absorbent, porous or permeable material capable of being impregnated or saturated with asphalt mixtures and preferably formed from felted fibres.

Asphalt has been used to weatherproof and give strength to felted backing webs in many types of floor and roof coverings. The usual process has consisted of passing the absorbent web through a vat of hot asphalt in a liquid state whereby the asphalt impregnates or saturates the web, the surplus asphalt being later removed by squeezing rolls.

Such saturating asphalts are ordinarily compounded with varying amounts of volatile oils, such as naphtha, to give the mixture greater fluidity, more penetrability, etc. There may be one or more volatile oils in the mixture, each having a different temperature at which it will vaporize. At low temperatures the asphalt mixture is viscous and has a low degree of flowability, but at higher temperatures of 200° F. to 300° F. it becomes thin and will easily and quickly permeate an absorbent web. At these higher temperatures, however, the volatile oil, with the

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lowest vaporization point, forms a gas at that temperature which produces bubbles and will blister or discolor any plastic film carried on the web.

The high temperature required for treating or curing both thermoplastic and thermosetting plastics has, prior to this invention, made it impossible to use therewith an asphalt-impregnated backing web. Commencing at about 200° some of the volatile oils in the asphalt vaporize, and forms blisters under the plastic film and as the temperature becomes higher the asphalt in the felt comes to the surface and discolors the ornamental plastic coating making it unserviceable.

To avoid this blistering and discoloration, it has heretofore been proposed to print the usual mineral and oil printing colors on an already hard plastic film and to then cement the film with suitable adhesives to an already asphalt-impregnated web thus forming a laminated floor covering. The machinery and processes necessary to produce such a floor covering have proved complicated and the product has consequently been expensive to manufacture.

As explained in my copending applications, Serial No. 10,417, of February 24, 1948, and Serial No. 31,486 of June 7, 1948, I have devised a method of producing ornamental floor coverings by a continuous rotary process in which the patterns are in colored plastics rather than in the usual printing fluids.

It is the principal objects of this invention to enable such ornamental plastic patterns to be deposited on a backing web, without any blistering or discoloration, when the flowable plastic is subject to essential high temperatures and yet to have the web impregnated with asphalt. I thus secure the long wearing and decorative qualities of a plastic upper layer and the weather resistant qualities of an asphalted lower layer by a continuous rotary process and at low expense.

The essence of my invention is to first deposit the flowable plastic ornamentation on what I call an untreated, backing web rather than on an asphalt impregnated web. Since the untreated web is comparatively inert, the flowable plastic may be passed through solvent evaporating ovens, curing or setting ovens at high temperatures with no deleterious effect on the plastic ornamentation or on the felt web. As the plastic is cured and hardened, it becomes bonded by heat to the upper layer of fibres of the felted web and the two cannot be separated without tearing the felt.

By the word untreated, I do not mean that

other coatings or impregnating liquids may not be present in or on the felted web but mean that such coatings or impregnating liquids, if present, are non-asphaltic and contain no other material tending to discolor or blister plastic under heat. For example, to smooth or level off the upper surface of the felted backing, I may apply a coating such as mineral and oil, by any well known process, in order to eliminate the wire screen marks mentioned above or to level off stray upstanding fibres or tufts in the felt. This smoothing coat may be bonded to the felt by heat or otherwise and the flowable plastic layer is then deposited on the smoothing coat.

If a smoothing coat is used which contains volatile oils or has a solvent as a vehicle, the solvents or volatile oils are evaporated out in a drying or heating oven prior to applying the viscous flowable plastic layer thereon. I thus avoid any tendency for the smoothing coat to blister or discolor the plastic during passage through high temperature ovens. I may use glue, silicate of soda, clay mixed with a suitable adhesive or plastics as a smoothing coat preferably free of any volatile oils.

After depositing flowable plastic on the felted web, with or without a smoothing coat, and curing or setting the same into a flexible hard condition, I then impregnate the backing with the asphalt mixture. By so doing, I have discovered that the volatile oils in the asphalt can be so controlled by proper temperatures that no discoloration or blistering takes place in the hardened plastic layer.

I may impregnate with any desired amount of asphalt but prefer what I call one hundred per cent saturation whereby the felt absorbs approximately its own weight in asphalt. Each fibre thereby becomes coated with the impregnating or saturating liquid but not to the extent that the liquid will ooze out of the felt upon the application of pressure thereto.

I have discovered that the amount of asphalt to give the desired percentage of saturation can be predetermined in the following manner. If one hundred per cent is the desired percentage and the raw felt web weighs one-eighth of a pound per square foot, I use one-eighth of a pound of asphalt per square foot. If the asphalt weighs about sixty-eight pounds per cubic foot, a layer covering one square foot and weighing one-eighth of a pound will be approximately twenty-two thousandths of an inch thick.

By using any of the well known types of coating devices such as knife coaters, roll coaters, etc., I then adjust the coater to deposit a layer of asphalt twenty-two thousandths of an inch deep on the surface of the felt web opposite to that upon which the plastic is carried. Pure asphalt at room temperature is a hard solid substance and volatile oils are mixed with it to make it pliable and viscous. I provide a coating pan with a heating device therein, such as heating coils, to maintain the asphalt mixture in a viscous flowable state. I prefer to use a coating roll which revolves in the heated coating pan and transfers a layer of molten asphalt, of the desired thickness, to the web by reverse coating, but may use direct coating, if desired.

The asphalt when deposited on the web may be at about 200° Fahrenheit at which temperature it is molten but quite viscous. The felt web with its layer of decorative hardened plastic and its opposite layer of molten asphalt is then passed through an oven at a temperature of about 250°-

300° Fahrenheit. At 250°-300° Fahrenheit the asphalt becomes thin and loses much of its viscosity so that it sinks into the felt becoming absorbed therein and thoroughly coating each fibre. It permeates the felt down to the hardened plastic layer, imparting great tensile strength and long wearing qualities to the felt of the web without blistering or discoloring the plastic.

It is obvious that I could impregnate the untreated felt in other ways such as by passing the web through a vat or between coating rolls and thus cover both the upper and under surfaces of the web with asphalt. However, in so doing, I find that the plastic decorative patterns are difficult to clean of asphalt and that the percentage of impregnation is difficult to predetermine. It is preferable to keep the decorative plastic surface out of direct contact with the asphalt and to allow a predetermined amount of the impregnating liquid to permeate from the opposite side of the web to the underside of the plastic layer as in my process.

In using thermoset plastics with my invention for example "Bakelite," the plastic upon passing through the subsequent step of asphalt-heating has no tendency to resoften even if the heating device is a hot air oven with indirect convection. However with thermo-plastic plastics which I prefer to use because of their greater pliability for example "Vinylite" or "Koroseal" which are vinyl resins, I have found that a hot air type of oven for heating the asphalt may resoften the plastic ornamentation and may cause it to be stripped off in patches on the guide rollers.

With thermoplastics therefore, I prefer to use a radiant-heat type oven such as the type using infra red bulbs. The web passes through such an oven with the plastic layer on the bottom and the viscous asphalt layer on the top. Since the asphalt is black, it attracts the heat rays of the infra red bulbs, which are placed above the moving web, and the plastic on the bottom of the web is not heated to the point of softening.

I have also discovered that I can use a smoothing coat as above-mentioned between the plastic and the felt web, and that such a coat can be light colored or white pigmented and therefore tend to repel such heat rays and protect the under layer of plastic from resoftening. In addition, I can also so compound my thermoplastic in a well known manner, that the resoftening temperature will be relatively high and the compound will thus have a less tendency to become tacky under the heat of the asphaltting oven.

My invention can be used to great advantage in the manufacture of roof coverings. The colorful ornamentation formed from flowable plastics and deposited on an after-impregnated porous backing web creates an attractive roofing material and, in addition, has the weather resistant and vapor barrier qualities of plastic films. The hardened plastic layer tends to prevent water from seeping into the backing material and tends to prevent the volatile oils still present in the asphalted backing from evaporating, thus prolonging the useful life of the roof covering.

It is obvious that I can use the apparatus shown for depositing and hardening flowable plastic as a means for depositing and impregnating the asphalt by adding heating devices to the pans, pipes and rolls thereof. For example, I can produce hardened plastic patterns on an untreated web for several days and wind the same in suitable rolls. I can then substitute viscous asphalt for viscous plastic in the coating pan, heat the necessary parts of my coating apparatus and run the

plastic coated webs through the device with the untreated surface at the top. By so doing, I secure a layer of predetermined depth, by precision machinery and am able to use one coating machine for two separate coating operations.

In the drawings,

Fig. 1 is a diagrammatic side elevation of the machine used in my process, but with the thickness of the plastic and asphalt layers greatly exaggerated for clarity.

Fig. 2 is a fragmentary side elevation of a backing web upon which a layer of viscous, flowable, plastic has been deposited.

Fig. 3 is a view similar to Fig. 2, showing the plastic after it has passed through the evaporating and setting oven and has been permanently set.

Fig. 4 is a view similar to Figs. 2 and 3, of the backing web turned upside down so that the set plastic pattern is on the under surface of the web and a layer of molten asphalt of predetermined thickness has been deposited on the other surface of the web.

Fig. 5 is a similar view showing the backing web impregnated with the asphalt down to the plastic layer.

Fig. 6 is a view similar to Fig. 2 showing the use of a smoothing coat between the web and the plastic.

As shown in Fig. 1, A is a coating pan containing a viscous, flowable plastic P in a background color. 1 is an applicator roll which revolves in pan A and picks up a film of plastic P, transferring it by reverse coating to a printing roll 2. 3 is a doctor roll, which revolves in the same direction as roll 1 to remove the surplus plastic P while 4 is a doctor blade to scrape the plastic from roll 3 back into pan A.

W is a backing web which may be of any absorbent, porous material, fibrous or otherwise, to which an impregnating liquid may be added for giving long wearing or other desirable qualities. It is preferably of untreated felt and is carried by a guide roll 6 beneath printing roll 2.

10 is a supply pipe from a container of viscous flowable plastic in another color, not shown, which feeds a swinging supply pipe 11 having an orifice 12 from which the colored plastic is discharged in a stream to form a zig-zag pattern 13 on background plastic P. I may also provide a container 20 for plastic 21, in still another color, there being a plurality of orifices 22 in the bottom 23 so that droplets 24 will also fall on either doctor roll 3 or the plastic background P on roll 1.

This construction is explained in my copending application, Serial No. 31,486, filed June 7, 1948, and produces a colored design in viscous flowable plastic which is smeared by a smearing or mottling member C into what is known as a "marbled" pattern. The smeared pattern in plastic is smoothed by the piling up action of the roll 2 as it reverse coats the web W at 1 at a greater speed than that of the web.

The web W with its smoothed pattern of plastic then passes through an evaporation oven 40 which may be at a temperature of about 250° and which evaporates the solvents from the plastic.

After the evaporation of the solvents, the web passes through a setting oven 50, at a temperature of about 375° Fahrenheit during which time the plastic is cured or hardened into its final tough state.

The web W with its set plastic layer S then leaves the oven 50 and is coated with a layer 60

of molten asphalt of a predetermined thickness. An asphalt coating roll 62 is provided which preferably revolves in reverse coating relationship to web W and which has a doctor roll 63 and doctor blade 64 to remove surplus asphalt and to adjust the thickness of the layer of asphalt 60. The asphalt coating pan 66 contains asphalt in a molten state, maintained so by heating coils 67, 67 or in any suitable manner.

A roll 70 is provided whereby the web is reversed upon itself, bringing the decorative plastic surface to the under side and the asphalt coating to the upper side of the web. The web is then passed through an oven 80 of the infra red bulb type which may be at a temperature from 200° to 300° Fahrenheit and which causes the asphalt to become extremely fluid and thin. As it passes through the oven, the asphalt sinks into the felt web, permeating every aperture and coating every fibre until it disappears as a separate layer entirely.

A roll 90 is provided to again reverse the web, after it has been impregnated with asphalt and guides the web to subsequent processes which may be cutters, winders, or similar machines for handling the final product after it has dried out.

The ovens used in my process may be of any well known type, using infra-red bulbs 100, or other radiant heating means, and of course, need not be constructed in the manner shown necessarily. Similarly any of the plastic depositing methods shown in my copending application, Serial No. 31,486, filed June 7, 1948, or Serial No. 10,417, of February 24, 1948, may be used to form the decorative layer of flowable plastic on web W, the particular one shown in this application being merely for illustration purposes.

I may, of course, operate the asphalt coating roll 62 at a greater speed than the web W, to pile up a heavy layer of asphalt on the web, for example at a ratio of 3 to 1 or greater. Although not shown in the drawings, I can cause the web to pass through the various ovens in festoons, to secure a longer period of heat by the use of suitable idler and guide rolls, or I can use festoons for the purpose of cooling the web, after it has come out of oven 80.

It is apparent that the raw felt web used in my process can be given a base or sizing coating of heat resisting material such as enamel for the purpose of smoothing the surface of the web to receive the ornamental flowable plastic coating. In fact, the web may be of any suitable material and may be treated with any suitable impregnating liquids provided neither web nor liquid will deteriorate the plastic under the high temperature of the setting oven.

In Fig. 2, I show a porous web W upon which a layer of ornamental flowable plastic P has been deposited. The plastic is viscous at this stage and has no tendency to permeate into the web. In Fig. 3, I show, the flowable plastic S after it has been converted by high temperature to a final hard state. Upon curing or setting of the plastic, it becomes bonded to the surface fibres of the web W.

As shown in Fig. 4, the next step in my invention is the depositing of a layer of viscous asphalt 60 of predetermined depth on the side of the web opposite to that carrying the hard plastic. In Fig. 5, the asphalt 60 is shown as having been heated and having permeated through the porous web impregnating the same to a predetermined proportion.

In Fig. 6 I show the porous web W with a

smoothing coating L, applied thereto and a layer of flowable plastic deposited on the coat.

I claim:

1. The process of continuously producing a web of floor covering material having a hard, pliable layer of decorative, thermo set, plastic, bonded to an asphalt-impregnated backing web which comprises the steps of successively depositing a layer of flowable, thermo setting plastic, in decorative patterns, on one surface of a continuously moving, asphalt-permeable backing web; subjecting the moving web, and its layer of thermo setting plastic, to heat sufficient to set the plastic into a hard, pliable, decorative, layer bonded to the web; coating a layer of flowable asphalt only on the opposite uncoated surface of said continuously moving web without contacting the decorative plastic surface thereof with said asphalt and subjecting the moving web, and its plastic and asphalt layers, to heat sufficient to liquify the asphalt and to cause it to impregnate the backing web.

2. The process of continuously producing a web of floor covering having an upper layer of hardened, synthetic resin, in a decorative pattern bonded to a lower layer of asphalt-impregnated backing material which comprises the steps of roll-coating a layer of flowable, viscous, synthetic resin, in decorative, colored patterns, onto one surface of an asphalt-permeable backing web continuously moving in a direction opposite to that of the roll at the point of contact therewith; hardening said layer of synthetic resin while traveling on said moving web; roll coating a layer of flowable, viscous asphalt onto the opposite surface of said moving web; overturning said moving web to bring the asphaltic layer to the top and liquifying said asphaltic layer, by the application of heat, until it has completely permeated into said moving web down to the under surface of said plastic layer.

3. The process of continuously producing a web of floor covering having an upper layer of hardened synthetic resin, in a decorative pattern and a lower layer of asphalt-impregnated backing material which consists in first forming a heat hardened layer of said synthetic resin, in a decorative pattern on one surface of a continuously moving web of said backing material, and, subsequently, impregnating liquified asphalt into said moving web only from the opposite surface thereof without contact with the decorative, hardened pattern on said upper layer.

4. The process of continuously producing a web of floor covering having a hard, pliable layer of decorative thermo plastic material on

an asphalt-impregnated backing web which comprises the steps of depositing a layer of flowable thermo-plastic material, in decorative patterns, on one surface of a continuously moving asphalt-permeable, backing web; then hardening said thermo plastic decorative patterns on said web; then depositing a layer of flowable asphalt only on the opposite surface of said continuously moving web and then exposing said layer of flowable asphalt to radiant heat until it has liquified and permeated into said moving backing web while shielding said plastic layer from said radiant heat.

5. The process of continuously producing a web of floor covering having a hard pliable layer of decorative thermo-plastic material on an asphalt-impregnated backing web which comprises the steps of coating a light colored layer on the upper surface of a continuously moving asphalt-permeable backing web; then coating a layer of flowable thermo plastic material, in decorative patterns, on said light colored layer; then hardening said thermo plastic decorative patterns while traveling on said web; then coating a layer of dark colored flowable asphalt only on the opposite uncoated surface of said moving web of backing material and then directing radiant heat only at said layer of dark colored asphalt until it has liquified and permeated into said moving web as far as said light colored layer without exposing said plastic layer to said radiant heat.

6. A process as specified in claim 1 including the step of controlling the percentage of saturation of asphalt in said backing material by controlling the vertical depth of the layer of viscous asphalt coated thereon.

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