Method of forming rubber articles

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ZUSAMMENFASSUNG auf verfügbar

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Patented Aug. 7, 1934 I. If STATES ,QME'THODHOF FOnMmG-
RUBBEKARTICLES i V T Stewart'R'.'Staten Island,"Nrjaassignor to The Naugatuck Chemical Company Nauga tuck, Conn, a corporation of Qonncctlcut Serial No. 694,520 11 Claims. (c1. 8

-- 1 No-Drawing. Application October: i933 This invention relates tomethods of forming rubber articles and-more particularly to methods of forming rubber articles directlyby deposition ofrubber from rubber latex.

5 The pr'eparationiof rubber articles by deposition from latex on to a form. or'depositionbase surfaced. with a latexv coagulant is well known. Rubber articles have been produced by'treating a porous or non-porous form first with a coagulant; such .as aceticacidor the like, and then dippingthe treated form into latex, retaining the form in the latex-until the desired thickness of rubber has been coagulated on the surface, removing the form and then drying toform the finished article. process are known wherein a hollow porous form is'u'sed and the coagulant isretained inthe form itself and allowed to seep out from the interior ot the form to the surface thereof, thereby coagulating rubber on the surfacetof .the form from the latex in which the form may be submerged. Porous and non-porous forms have been coated with an absorbent material, such as gelatin and the like, into which has been incorporated a coagulating material, and the treated form dipped-into latex untilsa film .of the desired thicknesshas been produced on the surface of the form, and then the form removed and :the. deposit dried. Dipping forms and the like have. also'been. first treated withlatex and thendipped into acoagulant whichV-coagulates the latexcoating and provides a coagulant associated with the newly coagulated latex -layer which will diffuse into the latex on a subsequent dipping and coagulate on the previously coagulated latex layer, a second film of latex coagulum. Similarly, latex forms have been surfaced with a rubberv cementwhich-may contain a eoagulantsuch as acetic acidv or surfaced with dried rubber in numerous ways and then treated with a latex coagulant to absorbthe same in the-rubber surface prior to dipping into latex to produce a rubber film of the desired thickness. I'he disadvantages of the majorityv of these methods are obvious. When treating a non-porous formswith a liquid coagulant alone, itjisp'ractically impossible'to get enough coating' of uniformthickness to give'the'desired thickness of deposited rubber film. Those cases where'a' coagulant diffuses through the pores of the form itself are limited to porous forms which in many cases are prohibitively expensive. Other processes necessitate two or more step op erations forjpr'eparing theform, while still-other processesjsuchas in coating 'theform with rub- Variousv modifications of this ber cement and coagulant; whether. by 1 onev .or, two step process-as :above described, provide ;a substantially water impervious .film of rubber; from only the surface. of which. isthe coagulant capable "of difiusing .readily into .the latex.

The present invention relates more particularly to methods of "formingnrubbe'r. articles where?- by a base'm'ay be coated Withfa latex coagulant associated with a rubber material in such a, way. that theijcoatinggon the base :is: substantially waterfij 'permeable and the coagulant" is. free throughout the thickness of the. applied :coagu-. latin'gYcoating-to difluse

immersed into latex; the coagulant is free to-"diffuse into the-latex not only'from merely the outer surface of the treated form, but from'the interior. of all-portions ofthe coat-1 ing. A coating of rubber from'latex may then be obtained by immersing-the thus treated form in lat'e'x and allowing-the same toremainfin the latex-until suflicient' coagulant has diffused into the latex to pro'vid'e thev desiredthickn'ess. ofla'te'xeoagulum, the structure of the coating .on the format alltimes allowing diffusion of mag-- ulant from the'inside of the same outwardlyto the latex surface 'incontact'therewith. 7 Various methods may be utilized f'or providing the desired-porous rubber'layer containing'latex coagulant in the pores or interstices of the-same. A present preferrdmethod of carrying out the invention'is illustrated belowybut it is 'not desired thereby to limitthe invention since many other-methods of producing the desired result willoccur to personsskilled-in theart. 5;:- A' solution of hydlrated'magnesium. acetate (which is exemplary-of a'latex'coagdlant) is preparedby dissolving 100 grams of-the salt in 125' grams of water; and adding .70 grams of ethyl alcohol. Then" 85: grams of the re,- sulting' solution 'aremixed with 200 grams ofa 5%"rubbet cement made with'70-73= B. naphe th'afl The resulting -mixture', which is a clear solution, contains-an amount of alcohol which is just short of that required tocause incipient flocculation of the rubber." :The dipping form isthen dipped'in this solution'a'nd removed; the solution," of course, being viscous enough 'to provide *an appreciable thickness of coating. on removing the form fromthe: .liquid,: .the naphtha,- being the more volatile, evaporates Till;

evaporation of the naphtha and the insolu-.

bility of the rubber in the remaining mixture.

Instead of alcohol, other"desolvating' agents (organic liquids which are substantially non.- solvents of rubber but soluble in rubber solvents) having a lower vapor pressure than the rubber solvent utilized in the preparation of the rubber cement and hence which evaporate less rapidly than the rubber solvent may be used.

For example, an amount of a desolvating agent such as acetone or methyl acetate or the like just short of that required to cause incipient flocculation of 'therubber in the coating composition may be utilized instead of the alcohol shown in the example: .At this point, the coating consists of a reticulate rubber filmcontaine ing rubbersolvent, and a liquid phase. including the latex coagulant in the interstices of the film. The form as thus treated may then be dipped into a latex bath. If desired, however, the more volatile constituents, namely, alcohol and naphtha, may be further or completely evaporated as by heating the coated form at an elevated temperature for a short periodtof time, say at 180 F. for 15 to- 30 minutes. If the alcohol and naphtha are substantially removed by such treatment, thecoating then consists of a porous network of rubber free of rubber solvent and containing only. an aqueous solution of the magnesium salt in the continuous aqueous phase in the interstices. The liquid phase, however, cannot drain oil as it is firmly held in the porous layer of rubber, presumably by capillary forces. If desired, completeievaporation of the water'may take place leaving the dry latex coagulant distributed throughout the porous structure. On dipping a form treated according to the present invention into the latex, the. coagulant, being contained in ,open pores and being accessible to the aqueous phase of the latex, is capable of diffusing freely. and rapidly into the'latex from any portion throughout the entire thickness of the rubber layer, thus effecting a rapid deposition of latex solids on the form. During subsequent drying and/or vulcanization, the porous rubber stratum coalesces and becomes water-impermeable and,i n-' tegral with. the latex deposit.

Various other salts which are latex coagulants,

,for example, zinc acetate, calcium chloride, magnesium sulphate and calcium. sulphatamaybe utilized instead of the magnesium acetate shown in the 'above illustration. Other well known latex coagulants 'may be utilized providing of course, that on the setting of the organic solvent solution of rubber to a non-flowing gel, the coagulant is associated with the liquid phase which is immiscible with the rubber-containing phase. If desired an aqueous solution or suspension of a latex coagulant, for eXample may be emul-' sified in an organic solvent solution of rubber to form a fluid rubber, cement which-may be applied to the desired base and which upon sufficient evaporation of the rubber solventsets to a non-flowing porous rubber ,film containing water and coagulant in the pores. The deposi- .ods well known in the art. be unvulcanized and, if desired, may contain vulcanizihg ingredients, or it may be prevulcanof rubber or rubber-like materials as well asnatural latex, which may be preserved or compounded or otherwise treated as desired and which may be in a normal, diluted, concen trated, orp'urified condition produced by meth- Such a latex may ized, all as is well known in the art. The coating containing the coagulant may, of course, be applied to the form or base by methods such as dipping; spreading, spraying or the like, and the latex may subsequently be applied in a similar manner to the thus treated form;

":In' view of .the many changes and modifications that may bemade without departing from the principles underlying the invention, refer ence should be made to the appended claims for an. understanding of the scope of the invention.

Having thus described my invention, what 'I claim. and desire to. protect by Letters Patent 1s:.. 1. "A method of forming a rubber article comprising applying to a base a fluid organic solventxsolutionof rubber containing a latex coagulant :and material which evaporates less readily than the rubber solvent and which is capable of efiecting setting of the composition to a non- 1" flowing gel on evaporation of a portion of the rubber solvent, allowing the volatile constituentsiof the composition to evaporate at least until setting occurs, and applying latex to the thus treated base.

2. -A method of forming a rubberarticle comprising applying to a base a fluid organic solvent-solution of rubber containing a latex coagulant and a proportion of desolvating agent which has a lower vapor pressure. than the rubber solvent, ins'ufficient to cause incipient flocculation of the rubber, allowing the volatile constituents of thecomposition to evaporate at least untilthe proportion of desolvating agent relative to the' rubber solvent has increased sufli- 3* ciently to efiectsetting of the compositionyand applying latex-to the thus treated. base.

3. Amethodof forming a rubber article comprisingapplying .to a base a fluid organic solvent solution of rubber containing an aqueous solution-of a latex coagulant and a proportion of alcohol, relative to the rubber solvent, insufficient to cause incipient flocculation of the rubber, allowing-the volatile constituents of the composition to evaporate at least until the proportion of 5 alcoholrelative to: the rubber solvent has increased sufficiently to efiect setting of thelcom position, and applying latex to the thus treated base." 1

' 11 A method of forming arubber article com-- prising applying to a bas ea fluid organic sol+ vent solution of rubber containing alcohol and an aqueous solution of asalt which is a latex coagulant, said alcohol being in a proportion, relative to the rubber solvent, insuflicient to cause incipient flocculation of the rubber, allowing the volatile constituents of the composition to evaporate at least until the proportion of alcohol, relative to-the -rubber;. solvent, has increased sufficiently to eiTect setting of the composition, and then applying latex to the thus treated base.

5. A method of forming a rubber article comprising applying to a base a fluid organic solvent solution of rubber containing an aqueous solution of a latex coagulant, allowing the organic solvent to evaporate at least until the composition is set to a non-flowing gel, and applying latex to the thus treated base.

6. A method of forming a rubber article comprising associating a non-flowing rubber gel containing an aqueous solution of a latex coagulant distributed therethrough with a deposition base, and applying latex to the thus treated base.

'7. A method of forming a rubber article comprising associating a non-flowing rubber gel containing an aqueous solution of a salt which is a latex coagulant with a deposition base, and applying latex to the thus treated base.

8. A method of forming a rubber article comprising associating a porous rubber layer containing a latex coagulant in the interstices thereof with a deposition base, and applying latex to the thus treated base..

9. A deposition form. for the coagulation of latex thereon comprising a base and a coating on at least a portion of said base comprising a non-flowing rubber gel containing an aqueous

REFERENZIERT VON

Zitiert von Patent	Eingetragen	Veröffentlichungsdatum	Antragsteller	Titel
US3243491 *	1. Okt. 1962	29. März 1966	Us Rubber Co	Methods of making foam products
US3298896 *	23. Mai 1962	17. Jan. 1967	Szegvari Andrew	Film for receiving, storing or controlling electric impulses

* Vom Prüfer zitiert

KLASSIFIZIERUNGEN

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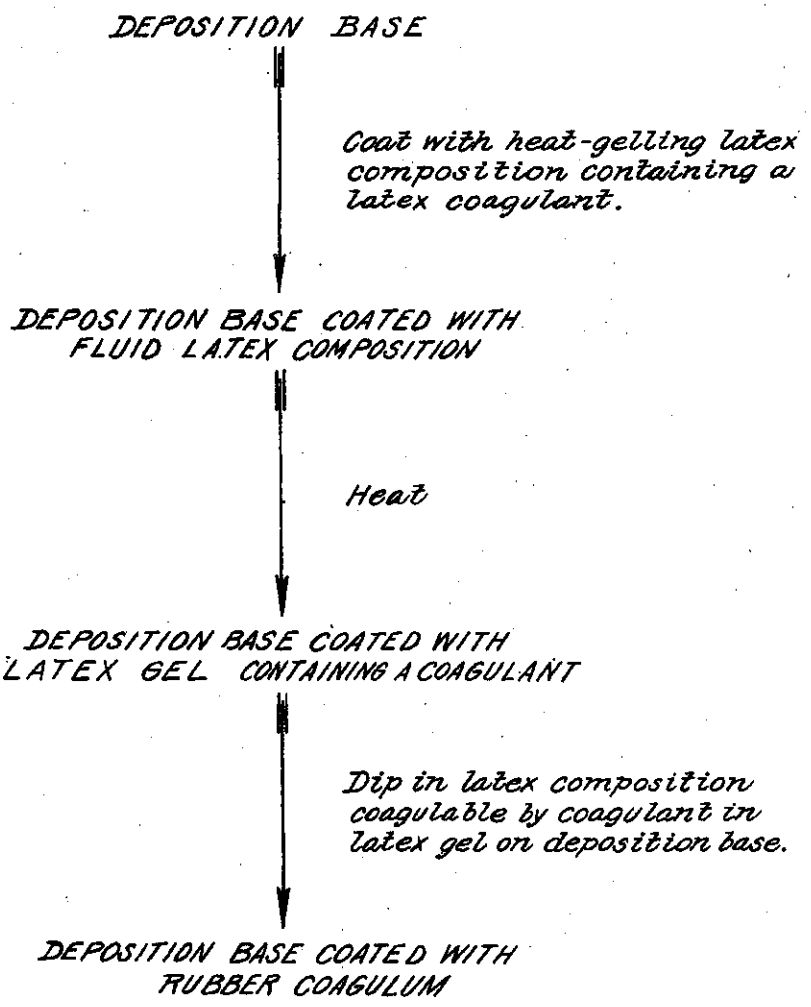
Europäische Klassifikation	C08J5/02

Sept. 24, 1940. S. R. OGILBY 2,215,562

METHOD OF FORMING RUBBER ARTICLES

Filed April 7, 1939



INVENTOR.
STEWART R. OGILBY

BY Lester G. Bradley

ATTORNEY.

Patented Sept. 24, 1940

2,215,562

UNITED STATES PATENT OFFICE

2,215,562

METHOD OF FORMING RUBBER ARTICLES

Stewart R. Ogilby, Staten Island, N. Y., assignor to United States Rubber Company, New York, N. Y., a corporation of New Jersey

Application April 7, 1939, Serial No. 266,534

6 Claims. (Cl. 18—58)

This invention relates to methods of forming rubber articles and more particularly to methods of forming rubber articles directly by deposition of rubber from latex.

In my prior Patent 1,969,275, there is described a method of producing rubber articles by coating a form or deposition base with a fluid rubber cement containing an aqueous solution of a latex coagulant and a proportion of alcohol relative to the rubber solvent insufficient to cause incipient flocculation of the rubber, allowing the volatile constituents of the composition to evaporate until the coating sets to a non-flowing gel or porous rubber layer, and then associating the thus treated base with latex as by an immersion process for a time sufficient to deposit the desired amount of coagulum on the form by migration of the coagulant into the latex. The rubber deposits formed in this manner may be dried and stripped from the form, or may remain as a coating on the base as part of the finished article. This process has many advantages over the prior processes of forming rubber articles by direct deposition from latex as fully discussed in the prior patent. The utilization, however, of rubber solvents, such as naphtha, to produce the rubber cement, and of desolvating agents, such as alcohol, to maintain the rubber cement and coagulant composition fluid until after the evaporation of the solvent on the base produces flocculation of the rubber and setting of the film, are undesirable from a cost and hazard viewpoint. The present invention is an improvement over the process of my prior Patent 1,969,275 and provides a method of depositing from a latex composition on the surface of a form or deposition base a rubber gel containing a reservoir of coagulant for subsequent treatment with conventional latex compositions without the disadvantageous use of volatile organic solvents and desolvating agents as in the prior patent.

According to the present invention, a heat-gelling latex composition containing a latex coagulant is applied to a base and heated to form a gel. The term "gelling" is used herein in its accepted sense as applied to a latex compound to signify the change of state of the rubber from a dispersed state to a state wherein the rubber forms a continuous phase in the form of a network in the pores or cells of which is included the whole of the dispersion medium, thereby forming a gel having a homogeneous structure. The thus formed deposit containing the coagulant is then associated with a second latex composition which is coagulable by the coagulant in the first latex composition, that is a second latex which has not been protected against coagulation by the coagulant, whereby the second latex composition becomes coagulated on the surface of the first deposit.

In prior methods where an acid latex on the surface of a form has been utilized to coagulate an alkaline latex as in a second dipping bath, the acid latex has not been capable of gelling on heating and hence only a thin film of the acid or coagulating latex could be applied to the form and only by careful control of its drying before dipping into the alkaline latex could the first coagulating layer be evenly distributed on the surface of the form for the subsequent dipping operation.

With the present invention, the coagulating layer is evenly distributed over the surface of the form immediately on gelling, and any desired thickness of the coagulant film may be built up since the form may be heated and dipped in a latex composition containing the coagulant and a film built up whose thickness is dependent only on the length of time the form is held in the latex. I have found that the latex composition containing the coagulant will be readily protected against coagulation at room temperature but not protected at elevated temperature in the presence of a condensation product of a straight chain aliphatic alcohol having at least 6 carbon atoms with a polyglycol compound containing at least 4 ethenoxy groups. The commercial name of one such condensation product is "Emulphor-O," believed to be the condensation product of tetraethylene glycol with oleyl alcohol. The addition of other protectives, such as heat-coagulable proteids, may also be used to stabilize the latex containing the coagulant at room temperature but not at elevated temperature, but these materials may leave undesirable residues in the final rubber product.

It has been found that up to 5% of "Emulphor-O," for example, permits a latex composition of over 30% solids content to be acidified as far as a pH of 1 and yet the "Emulphor-O" will lose its power to protect the latex at elevated temperatures and the latex composition will gel on heating. A gelled deposit equivalent to .10 inch thickness of rubber after drying can be formed by dipping a mold heated to between 80° C. and 100° C. for ½ to 1½ minutes in a latex composition of 50% rubber concentration containing "Emulphor-O" and having a pH of 4.4. A form coated with such a gel containing acidic material can then be dipped in a latex composition which

is coagulable by the acid in the gel and be permitted to remain in the latex until any desired thickness of film has been built up. If desired, the form can first be dipped in the latex containing the latex coagulant and the protecting condensation product at room temperature and removed without heating, and then be heated to give a rubber gel containing the desired latex coagulant and having a thickness equivalent after drying to .002 to .003 inch. Such a film is much thinner and hence contains less latex coagulant than where the form is heated on or prior to immersion in the heat-gelling latex, but the elimination of the introduction into the bath of the heated form prevents destabilization of the bath as a whole by the gradual rise in temperature incident to the repeated introduction of the heated forms.

The "Emulphor-O," or other protective which stabilizes the coagulant latex composition at room but not at elevated temperatures, may similarly be used to produce a heat-gelling latex composition containing a polyvalent metal salt instead of acid as the latex coagulant. Such a latex can be applied to the surface of a form and gelled thereon and then used to build up a film of the desired thickness by dipping in a latex composition which has not been protected against the coagulating action of the polyvalent metal salt. In these dipping processes with polyvalent metal salts as the coagulant, it is preferred that the heat gelling latex composition have an acid reaction, since it is difficult to obtain a large concentration of many coagulant salts in alkaline latex compositions, because of the hydrolysis of the salt and the precipitation of insoluble polyvalent metal hydroxides. By lowering the pH below 7 when the latex coagulant to be utilized in the heated gel is primarily a polyvalent metal salt, it is possible to obtain a gel having a relatively higher concentration of the coagulant salt. The gelled latex containing the coagulant may be partially or completely dried before being associated with the latex composition which is coagulable by it providing of course the drying does not volatilize sufficient coagulant to prevent coagulation of the second latex. Instead of dipping forms into the latex compositions, methods involving the spraying of latex on forms may be used. Also, the latex containing the coagulant and protective may be gelled in a mold in a known manner and the gelled deposit be removed from the mold and, after drying, if desired, be dipped in or otherwise associated with the unprotected latex composition.

The following examples are illustrative of the invention:

Example 1

A latex composition stable at room temperature was prepared according to the following formula:

		Parts by weight
Latex	Rubber	100
	Water	62
	NH_3	.2
25% aqueous solution of "Emulphor-O"		12
15% aqueous solution of acetic acid		25

The pH of the above latex composition was 4.4. A glass form heated to 97° C. was dipped into this latex and allowed to remain for 2 minutes before being removed. This dip gave a non-fluid deposit of gelled latex .2 inch thick, which on drying gave a film thickness of .1 inch. Another form heated to 97° C. was dipped into the above latex composition and allowed to remain ten seconds, during which time a deposit of gelled latex equivalent to a dried film thickness of about .01 inch was formed. The form with the adherent gelled latex deposit was then dipped in a conventional latex dipping compound, allowed to remain for one minute, removed and dried. This gave a thickness of the final product of .025 inch. The conventional latex dipping compound was made according to the following formula:

		Parts by weight
Latex	Rubber	100
	Water	61
	NH_3	.8
35% aqueous solution of formaldehyde		4.9
20% aqueous solution of KOH		3
20% aqueous solution of potassium oleate		2.5
Sulphur		.7
Zinc oxide		2
Accelerator		1
Antioxidant		.5

Water to 57% solids.

Example 2

A latex composition stable at room temperature was prepared according to the following formula:

		Parts by weight
Latex	Rubber	100
	Water	62
	NH_3	.8
25% aqueous solution of "Emulphor-O"		12
15% aqueous solution of acetic acid		17.4
Sulphur		3
Accelerator		.5
Aqueous solution magnesium acetate		100

The solution of magnesium acetate was made by dissolving 7 parts by weight of pure calcined magnesia in a mixture of 22 parts by weight of glacial acetic acid and 71 parts by weight of water. The pH of the magnesium acetate solution was 5.5. The pH of the latex compound was 6.0. A glass form heated to 97° C. was dipped into this latex composition and immediately removed. This "in and out" dipping of the form gave a gelled film equivalent to a dried deposit of about .01 inch in thickness. The form with the gelled coating of the above latex composition was then dipped in a conventional latex dipping compound and allowed to remain for three minutes. The form was then removed and the deposit dried. The final article had a gauge of .03 inch in thickness. The conventional latex dipping compound was made according to the following formula:

		Parts by weight
Latex	Rubber	100
	Water	60
	NH_3	.3
37% aqueous solution of formaldehyde		1.1
20% aqueous solution of KOH		4.5
20% aqueous solution of potassium oleate		1.25
Sulphur		1.5
Zinc oxide		2
Accelerator		1.2
Antioxidant		.1

Water to 55% solids.

It is understood that the form may be dipped at room temperature in the heat-gelling latex composition containing the latex coagulant and the deposit heated to gel the same after removal and before dipping in the second latex composition which is coagulable by the coagulant in the

gelled deposit. In view of the many changes and modifications that may be made without departing from the principles underlying the invention, reference should be made to the appended claims for an understanding of the scope of the invention.

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

1. The method which comprises applying to a base a heat-gelling latex composition containing a latex coagulant and forming on said base a gelled deposit of said latex composition by the application of heat, and associating the thus formed deposit with a second latex composition coagulable by the coagulant in the deposit.

2. The method which comprises applying to a base a heat-gelling latex composition containing a latex coagulant and a condensation product of a straight chain aliphatic alcohol having at least 6 carbon atoms with a polyglycol compound containing at least 4 ethenoxy groups and forming on said base a gelled deposit of said latex composition by the application of heat, and associating the thus formed deposit with a second latex composition coagulable by the coagulant in the deposit.

3. The method which comprises applying to a base a heat-gelling latex composition containing a latex coagulant and "Emulphor-O" and forming on said base a gelled deposit of said latex composition by the application of heat, and associating the thus formed deposit with a second latex composition coagulable by the coagulant in the deposit.

4. The method which comprises dipping a form in a heat-gelling latex composition containing a latex coagulant and producing a layer of gelled deposit of said latex composition by the application of heat, dipping the thus treated form in a second latex composition coagulable by the coagulant in the deposit, and maintaining the form in said second latex composition until the desired thickness of rubber deposit has been built up on the form.

5. The method which comprises dipping a form in a heat-gelling latex composition containing a latex coagulant and a condensation product of a straight chain aliphatic alcohol having at least 6 carbon atoms with a polyglycol compound containing at least 4 ethenoxy groups and producing a layer of gelled deposit of said latex composition by the application of heat, dipping the thus treated form in a second latex composition coagulable by the coagulant in the deposit, and maintaining the form in said second latex composition until the desired thickness of rubber deposit has been built up on the form.

6. The method which comprises dipping a form in a heat-gelling latex composition containing a latex coagulant and "Emulphor-O" and producing a layer of gelled deposit of said latex composition by the application of heat, dipping the thus treated form in a second latex composition coagulable by the coagulant in the deposit, and maintaining the form in said second latex composition until the desired thickness of rubber deposit has been built up on the form.

STEWART R. OGILBY.

Method of making sponge rubber

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External Links: USPTO, USPTO Assignment, Espacenet

DESCRIPTION (OCR text may contain errors)

CLAIMS available in

Patented Jan. 19, 1943 METHOD OF MAKING SPONGE RUBBER Stewart R. Ogilby, Staten Island, N. Y., assignor to United States Rubber Company, New York, N. Y., a corporation of New Jersey No Drawing. Application January 15, 1941, Serial No. 374,473

v 2 Claims.

This invention relates to methods of making sponge rubber, and more particularly to processes for producing sponge rubber from rubber latex compositions.

According to the present invention, a latex composition is beaten or whipped or otherwise converted into a froth or foam, and then frozen or subjected to reduced temperature to irreversibly coagulate the rubber solids therein, thereby forming a permanent sponge rubber mass superior to those produced by prior methods.

It is well known that when a heat-sensitive latex, that is, a latex composition which is coagulable upon heating, is whipped into a foam and subjected to sufficient heat to irreversibly coagulate the rubber solids in the foam, the cell walls in the foam are subject to a certain amount of breakdown. This breakdown of the cells or bubbles is believed to be due in part to the natural drainage taking place in the foam with the attendant weakening of the cell walls, and in part to the expansion of the gas entrapped within the cells. This breakdown of the cell walls results in an increase in the average size of the pores in the sponge, with the result that the final sponge rubber article contains pores which on the average are larger than were the bubbles in the original foam. The breakdown of cell walls may be carried to such a point that the final sponge will have a loosely stereoreticulate structure, 1. e., a structure having the appearance of a three-dimensional net, which is usually regarded as undesirable. In the prior art process for manufacturing latex sponge by the use of either heat-sensitive latices or latices which contain a delayed action coagulant, particular precautions must be taken and modifications must be made in the compounding and processing of the latex compound in attempting to avoid this stereoreticulate structure and to chain a final sponge article in which the pores approximate as closely as possible to the average bubble size in the original foam.

The present invention possesses the important I advantage over these prior methods in that without employing these previously mentioned precautions, it is possible to obtain a sponge which retains to a great degree the original pore size and arrangement of the uncoagulated foam, and

ids therein contained. The thus gelled or cobeen added certain cold-sensitizing agents, i. e.,

materials such as gelatin, which, when addedv to a latex which will not normally coagulate irreversibly when frozen, will cause such a latex to coagulate irreversibly when frozen. According to the present invention, moreover, with certain commercial latices now available, it is also possible to prepare a foam which will be coldsensitive even without a cold-sensitizing agent, that is, a foam which will coagulate irreversibly when chilled to a sufficiently low temperature; whereas the

understood; but its significance is that it is possible according to the invention to readily prepare a foam which can be irreversibly coagulated on freezing, from a latex composition which does not contain any added cold-sensitizing agent, and thereby obtain a latex sponge which for certain purposes is superior to a similar sponge made from a latex composition containing added cold-sensitizing agents.

The advantages of the method of preparing latex sponge by freezing a foam to irreversibly coagulate it, arise primarily from the fact that by chilling the foam rapidly, the liquid in the cell walls is immobilized thus preventing the cell wall drainage discussed above. Because the present process brings about the coagulation of the foam by a decrease rather than an increase in temperature there is no tendency for the gas within the cells to expand; rather, there is a tendency for the gas to contract with the result that it is thus possible to obtain a sponge having a structure in which the average pore size is equal to or somewhat less than the average bubble size in the original foam. The result is the formation of a sponge having a very desirable structure.

EXAMPLE I A commercial latex composition of the following formula was employed:

Compound 1 Latex: Parts by weight Rubber Water 61 Ammonia 1.32 Sulphur paste (62.5%) 5.0 Accelerator emulsion (50%) 1.5

bly. When the thus frozen foam was warmed up to room temperature the gel structure remained intact, leaving a wet sponge rubber article of shape determined by the interior of the mold. The article was then removed from the mold and vulcanized in an atmosphere of saturated steam at a pressure of 40 pounds per square inch. The article was then finally dried.

An experiment was performed in which a quantity of the above latex composition unfoamed and in bulk was rapidly frozen to a temperature of -60 C. under the conditions described above. When warmed, the latex film still had some of the rubber solids dispersed in the aqueous medium, thus showing that it had not coagulated irreversibly. The experiment demonstrates the fact that the frothed latex composition was more sensitive to coagulation by cold when frothed than in unfrothed condition. The present process, therefore, is particularly adapted to irreversibly coagulating by freezing a foamed latex composition which in continuous film is not irreversibly coagulable by freezing.

EXAMPLE II In another example, a latex composition was prepared as follows:

Compound 2 Latex: Parts by weight Rubber 100 Water 57.4

Ammonia 1.04 Dimethylamine oleate solution 7.5 Ammonia solution (28%) 2.0. Sulphur paste (62.5%) 4.0 Aqueous paste of zinc dibutyl dithiocarbonate (50%) 1.0

Zinc oxide paste (50%) 10.0 Aqueous gelatin solution (10%) 30.0

lated by reducing the temperature to the order of -8 C. after which they may be vulcanized and dried. The sponge rubber thus produced is not,

on the average, of such high quality as that which has been chilled at lower temperatures,

with respect to uniformity of texture. It maybe improved, however, by the addition either of a larger amount of gelatin or of other thickening agent, in order to compensate for the tendency of the latex to drain away from the surfaces of the small bubbles in the latex foam.

The original foam may be produced by injecting air or other gas into the liquid latex composition in any desired manner in the form of bubbles or gas cells, either by whipping the latex or by the use of chemical blowing agents. It is not necessary to reduce the temperature of some latex compositions to as low as -60 C. although it has been found that generally the lower the temperature, the finer is the texture of the resultant sponge rubber, The vulcanizing and drying operations may be carried out according to usual practice.

The term "latex" as used herein designates broadly coagulable dispersions of elastic materials including artificial dispersions of rubber or rubber-like materials, as well as natural latex, which may be preserved or compounded or otherwise treated as desired, as by vulcanization, and which may be in normal, concentrated, diluted or purified condition produced by methods well known in the art.

While I have shown and described certain present preferred methods of performing the invention, it is to be understood that it may be otherwise practiced within the spirit thereof and within the scope of the appended claims.

Having thus described my invention, what I claim and desire to protect by Letters Patent is: 1. The method of making sponge rubber which 4 comprises converting a, latex composition to a foam and reducing the temperature of said foam to within the range C. to -18 c, and ufficiently to coagulate irreversibly the latex in the foam thereby forming sponge rubber.

2. The method of making sponge rubber which comprises converting a latex composition to a foam and reducing the

STEWART R. OGILBY'.

REFERENCED BY

Citing Patent	Filing date	Publication date	Applicant	Title
US2432353 *	Sep 11, 1946	Dec 9, 1947	Joseph A Talalay	Method of producing reticulated structures
US2604663 *	Jan 6, 1950	Jul 29, 1952	Anton Talalay Joseph	Method of making a cellular rubber article
US2649388 *	Aug 24, 1948	Aug 18, 1953	Philadelphia Quartz Co	Manufacture of silica filled materials
US6010651 *	Oct 22, 1998	Jan 4, 2000	Hsu; Chin-Chao	Latex leather sheet fabrication method
DE1098702B *	Aug 31, 1954	Feb 2, 1961	Joseph Anton Talalay	Form zum Herstellen von Polsterkoerpern aus Gummi, insbesondere aus Schaumgummi

* Cited by examiner

CLASSIFICATIONS

U.S. Classification	521/66, 264/50
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