PATENT SPECIFICATION

Application Date: April 14, 1939. No. 11351/39. **537,645**

Complete Specification Left: March 27, 1940.

Complete Specification Accepted: July 1, 1941.

PROVISIONAL SPECIFICATION

Improvements in or relating to the Preparation of Crude Rubber

I, HAROLD GEORGE CRUIKSHANK FAIRWEATHER, of British Nationality, of 65—66, Chancery Lane, London, W.C.2, do hereby declare the nature of this invention, (a communication from The B.F. Goodrich Company, a corporation of the State of New York, United States of America, of 230, Park Avenue, City, County and State of New York, United States of America), to be as follows:—

This invention relates to the preparation of crude rubber from the latex of the common rubber tree, Hevea Brasiliensis.

Heretofore practically all the crude rubber prepared on rubber plantations has been prepared by mixing the latex, either as it comes from the tree or after dilution to standard rubber content, with dilute acid such as acetic or formic acid, and allowing to stand for several hours in suitable pans or tanks until a firm coagulum is produced. The coagulum is then worked up either into sheet rubber, by pressing lightly between rollers and hanging up to dry in a smoke house; or into crepe rubber, by pressing firmly between closely spaced rollers over which water flows, and drying in air. Such manipulation involves a great deal of labor in the individual handling of the fractions of liquid deposited in each coagulating tank, of the coagulum to and through the various rolls employed, and of the wet sheet or crepe to and in the drying houses; and partly because of unavoidable differences in the manner in which different portions of the output are handled and in the conditions to which they are subjected in coagulation, sheeting and drying, the finished crude rubber is variable in its properties, particularly in rate of vulcanization.

In carrying out the present invention crude rubber is made from the latex of Hevea Brasiliensis by continuously mixing the latex with a coagulant to form a continuous ribben of coagulum, which may then be continuously pressed, washed, dried, or otherwise treated to prepare the desired grade of crude rubber. The coagulation of the latex with acid, unless uneconomically large quantities of acid are used, requires a time which is longer than is convenient for a continuous process, hence it is preferred to add to the latex a coalescence-accelerator which causes it to set up to a firm coagulum very quickly after the addition of the acid.

The coalescence-accelerators which may be used include the soluble salts of soap-forming fatty acids as well as of other organic acids which are almost insoluble in water but which form soluble salts, such as benzoic acid and certain phenols. It is known that latex which has been sterilized by pouring into boiling water (sometimes called B-liquid) and which is incapable of forming coherent coagula when acidified, can be induced to coalesce to a coherent coagulum by the addition of such materials; but it has not been known that they have any material effect on the properties of fresh latex.

The addition of a small proportion of one of the aforementioned coalescence-accelerators to fresh latex reduces the time required for the formation of a coherent coagulum from hours to minutes or even seconds. For example, fresh latex when mixed with fourteen times its volume of water containing about 0.033% acetic acid required almost an hour to form a coherent coagulum, while the same latex, if a solution of hard soap (largely sodium stearate) is first added in a proportion equivalent to 1% of stearic acid based on the dry rubber content of the latex, under the same conditions starts to coalesce in about one minute and forms a coherent coagulum in about two minutes.

Similar results are secured with other coalescence-accelerators of the type set forth above. Sodium soaps are at present preferred because of their availability at low cost and because they do not appear to introduce extraneous ingredients into the rubber. Other soluble soaps such as ammonium or potassium soaps may be substituted if desired. It is not even necessary that the soap be separated from the glycerine formed in the usual saponification process, for crude soap solution may be heating natural fats or fatty oils with alkali solution give good results and may be prepared at low cost from raw materials produced in the rubber growing countries themselves. The soaps of lauric, stearic,

[*Price* 1/-]

palmitic, oleic or other soap-forming fatty acids or the usual mixtures thereof may be used. Furthermore, phenols, such as beta-naphthol or *p*-nitrophenol give excellent results when added to the latex as solutions of their sodium salts.

The proportions of coalescence-accelerator may be varied over a considerable range. Even 0.1% based on the rubber content of the latex markedly accelerates coalescence, but larger proportions such as the 1% mentioned above act much more rapidly and greater acceleration can be achieved by still further increasing the amount used.

The quantity of acid required will depend on the dilution of the latex, and on the quantity and buffering effect of the coalescence-accelerator, acidification to a pH of about 5 or lower being advisable for rapid and complete coagulation. Acidification to a lower pH value, although it requires somewhat more acid, further accelerates coalescence. Raising the temperature likewise accelerates coalescence somewhat. Any of the usual acid coagulants may be employed, the organic acids such as formic, acetic, lactic and citric acids being preferred, although mineral acids such as sulfuric acid may be employed if desired.

The latex may be coagulated at about the concentration at which it is obtained from the tree, but a considerable dilution, either of the latex directly or by means of the solution of the coalescence-accelerator or of the coagulant, contributes greatly to ease and completeness of mixing. This is particularly important in the process of this invention because of the rapidity with which coalescence sets in when coalescence-accelerators are used. Thus, the coalescence-accelerator may be dissolved in a volume of water half that of the latex to be treated, and mixed with the latex, and the acid may be mixed with a further quantity of water equal in volume to the latex thus diluted. A mixture of equal volumes of these liquids then brings about coagulation at a concentration of about 10 to 12% rubber.

As is pointed out in a companion specification, crude rubber having a very low water absorptive capacity may be obtained by coagulating extremely dilute latex, removing the serum from the coagulum and heating the wet coagulum to a temperature over 75° C. and preferably 90° C. or higher. The process of this invention is very readily carried out under these conditions to give a water resistant rubber, as will be evident from the following examples.

The full advantages of this invention can be secured only by use of fresh latex, within a few hours of its collection. The storage of latex not only involves additional expense but requires the addition of preservatives which profoundly alter the properties of the latex. Thus ammonia in the proportions required for preservation destroys the responsiveness of latex to the preferred coalescence-accelerators. Formaldehyde likewise renders coalescence-accelerators ineffective when used in proportions sufficient to preserve the fluidity of the latex for a considerable time, although a small proportion of formaldehyde amounting to not over 0.1% on the latex and capable of preserving the latex only for a day or two does not have a great effect. Even soap added to latex loses its coalescence-accelerating effect unless the latex is promptly coagulated, so that soap-containing latex after standing twenty-four hours requires the addition of further quantities of soap to accelerate the coalescence. Caustic soda has less effect and may be used if it is necessary to preserve the latex for a time before it is coagulated, but even this preservative the minimum quantity requisite for the desired effect should be used, say 0.2% of the latex.

As a specific example of one embodiment of the invention, an apparatus similar to that shown diagrammatically in the accompanying drawing may be used. Fresh Hevea latex in the tank 1 is mixed with a soap solution containing a quantity of soap equivalent to 1% of fatty acid based on the dry rubber content of the latex, and the mixture is diluted to 4% dry rubber content. A volume of water equal to that of the diluted latex is placed in tank 2 and mixed with 0.066% acetic acid. The contents of the respective tanks are then withdrawn at the same rate through conduits 3 and 4 and introduced into the upper end of a long slightly inclined trough 5, preferably about sixty feet long and of such inclination that the latex requires two minutes to flow to the lower end. The continuous flow of the two fluids from adjacent outlets into the trough ordinarily brings about adequate mixing, but if desired baffles or other mixing devices may be used. The trough should be of a material to which the coagulum does not readily adhere, and should preferably be maintained wet further to reduce the possibility of adhesion. A porous material such as Portland cement concrete or wood will maintain itself sufficiently wet above the surface of the latex by capillary action, but this effect may be supplemented or replaced by fine sprays of water or by covering the trough to retard drying. Zinc metal is a very satisfactory material if

care is taken to keep it well wet, but aluminium shows an undesirable tendency to adhere to the coagulum. The mixture of latex and acid has a dry rubber content of 2%, and sets up as it flows down the trough. By the time it reaches the lower end it has coalesced to a continuous strip of coagulum having the same cross-sectional shape as the trough, and has begun to synerese, but because of its extremely low rubber content it is very soft and tender. The strip of coagulum 6 is floated over an overflow lip 7 at the lower end of the trough and passes to a pervious belt 8 which carries it between a pair of squeeze rolls 9. Another pervious belt 10 is run on the upper surface of the coagulum as it traverses the squeeze rolls to assist in the expression of serum from the coagulum and to prevent undue distortion during this operation. This preliminary squeezing compacts and strengthens the coagulum sufficiently to permit its passage directly through a battery of sheeting rolls 11, 12, 13, 14, which further compact it and express most of the remaining serum. The coagulum is then immersed in continuously renewed water at a temperature of about 90° C. in a tank 15 for about five minutes, then is dried, preferably in a continuous forced draft drier 16.

The product is a light colored, translucent, continuous sheet of rubber indistinguishable in most of its properties (other than its obvious difference in shape) from first latex crepe. It has a nitrogen content of about 0.3% and a normal rate of vulcanization and rate of aging. It differs from the present standard grades of rubber in having an extremely low water absorptive capacity comparable to the best "deproteinized" rubber, and freedom from mold, mildew or other blemishes, as well as a more rapid rate of breakdown on mastication. It may be cut up into sheets for baling or crating or may be rolled into cylindrical rolls as may be preferred.

The process may be carried out in other manners than that specifically described above. For example, the latex and acid may be diluted only sufficiently to give a coagulum of 10% dry rubber instead of 2% as above, but in this case the same extremely low water absorptive capacity will not be attained. The coalescence-accelerator may be omitted, but the trough will then have to be greatly lengthened because of the longer time required for complete coagulation.

Other coalescence-accelerators may likewise be employed with similar results. For example, the sodium salt of beta-naphthol gives the same rapid coalescence as soap when used in the same proportion.

If desired, a part or all of the process may be carried out discontinuously. Thus the strip of coagulum from the trough may be cut into sheets which may be individually sheeted and dried, or the mixture of latex, coalescence-accelerator and acid may be poured into pans or tanks to produce individual sheets of coagulum which may be worked up in the conventional manner. These modifications have the advantage that the extremely rapid coalescence permits the coagulating tanks or pans to be used over and over on the same day.

Dated this 14th day of April, 1939.

CRUIKSHANK & FAIRWEATHER,
65—66, Chancery Lane, London, W.C.2,
and 86, St. Vincent Street, Glasgow,
Agents for the Applicant.

COMPLETE SPECIFICATION

Improvements in or relating to the Preparation of Crude Rubber

I, HAROLD GEORGE CRUIKSHANK FAIRWEATHER, of British Nationality, of 65—66, Chancery Lane, London, W.C.2, do hereby declare the nature of this invention, (a communication from The B.F. Goodrich Company, a corporation of the State of New York, United States of America, of 230, Park Avenue, City, County and State of New York, United States of America), and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to the continuous treatment of Hevea latex (i.e. latex of the common rubber tree, Hevea Brasiliensis) to obtain crude rubber continuously therefrom.

Heretofore practically all the crude rubber prepared on rubber plantations has been prepared by mixing the latex, either as it comes from the tree or after dilution to standard rubber content, with dilute acid such as acetic or formic acid, and allowing to stand for several hours in suitable pans or tanks until a firm coagulum is ~~proposed~~ produced. The coagulum is then worked up either into sheet rubber, by pressing lightly between rollers and hanging up to dry in a smoke house; or into crepe rubber, by pressing firmly between closely spaced rollers over which water flows, and drying

in air. Such manipulation involves a great deal of labour in the individual handling of the fractions of liquid deposited in each coagulating tank, of the coagulum to and through the various rolls employed, and of the wet sheet or crepe to and in the drying houses; and partly because of unavoidable differences in the manner in which different portions of the output are handled and in the conditions to which they are subjected in coagulation, sheeting and drying, the finished crude rubber is variable in its properties, particularly in rate of vulcanization.

In accordance with the invention, a continuous method is provided of treating Hevea latex to obtain crude rubber continuously therefrom which, comprises continuously intermixing, in the presence of a coalescence-accelerator which is a water-soluble salt of a substantially water-insoluble organic acid, a stream of Hevea latex and a stream of dilute acid coagulant sufficient to bring the mixture to a pH not over 5, and removing the resulting coagulum as a continuous strip. The coalescence-accelerators which may be used include the soluble salts of soap-forming fatty acids as well as of other organic acids which are almost insoluble in water but which form soluble salts, such as benzoic acid and certain phenols. The latex so treated coagulates so rapidly that the mixture of treated latex and coagulant can be flowed along a shaped conduit such as a short trough and withdrawn at the end of the trough as a shaped continuous strip of coagulum. The coalescence can be still further accelerated by addition of a soluble salt of a polyvalent metal, such as calcium chloride. This continuous coagulation greatly facilitates production of crude rubber of uniform high quality.

It is known that latex which has been sterilized by pouring into boiling water (sometimes called B-liquid) and which is incapable of forming coherent coagula when acidified, can be induced to coalesce to a coherent coagulum by the addition of such materials; but it has not been known that they have any material effect on the properties of fresh latex.

The addition of a small proportion of one of the aforementioned coalescence-accelerators to fresh latex reduces the time required for the formation of a coherent coagulum from hours to minutes or even seconds. For example, fresh latex when mixed with fourteen times its volume of water containing about 0.033% acetic acid required almost an hour to form a coherent coagulum, while the same latex, if a solution of hard soap (largely sodium stearate) is first added in a proportion equivalent to 1% of stearic acid based on the dry rubber content of the latex, under the same conditions starts to coalesce in about one minute and forms a coherent coagulum in about two minutes.

Similar results are secured with other coalescence-accelerators of the type set forth above. Sodium soaps are at present preferred because of their availability at low cost and because they do not appear to introduce extraneous ingredients into the rubber. Other soluble soaps such as ammonium or potassium soaps may be substituted if desired. It is not even necessary that the soap be separated from the glycerine formed in the usual saponification process, for crude soap solution made by heating natural fats or fatty oils with alkali solution gives good results and may be prepared at low cost from raw materials produced in the rubber growing countries themselves. The soaps of capric, lauric, stearic, palmitic, oleic or other soap-forming fatty acids or the usual mixtures thereof may be used. Furthermore, phenols such as beta-naphthol or *p*-nitrophenol give excellent results when added to the latex as solutions of their sodium salts.

The proportions of coalescence-accelerator may be varied over a considerable range. Even 0.1% based on the rubber content of the latex markedly accelerates coalescence, but larger proportions such as the 1% mentioned above act much more rapidly and greater acceleration can be achieved by still further increasing the amount used.

The quantity of acid coagulent required will depend on the nature of the coagulant, the dilution of the latex, and on the quantity and buffering effect of the coalescence-accelerator; acidification to a pH of not over 5, measured with a glass electrode, preferably in the neighbourhood of 4.5 to 4.8, being advisable for rapid and complete coagulation. If an acid coagulant is used in a quantity insufficient to bring the latex to a pH of about 5 or lower, the coalescence may not be accelerated at all, even though the quantity of acid used is sufficient to bring about coagulation in the absence of the coalescence-accelerator. Acidification to a pH value even lower than 4.5, although it requires more acid, further accelerates coalescence. Raising the temperature likewise accelerates coalescence somewhat. Any of the usual acid coagulants may be employed, the organic acids such as formic, acetic, lactic and citric acids being preferred, although mineral acids such as sulphuric acid may be employed if desired, or even acid reacting salts such as alum, sodium bisulphate.

Coalescence may be still further

accelerated by the addition of suitable electrolytes. At an acidity corresponding to pH about 4.5 the relative effectiveness of the common electrolytes is represented approximately by the following lyotropic series:

(most effective)

chloride	magnesium
thiocyanate	calcium
nitrate	barium
phosphate	zinc
acetate	lead
ferrocyanide	potassium

(least effective).

The electrolytes if they are used, should obviously be compounds which liberate ions near the head of the series. Calcium chloride is extremely effective, inexpensive and readily available. In general, soluble salts of polyvalent metals are effective.

As an example of the effect of a suitable electrolyte, the coagulation time at pH about 4.8 in the presence of 1% fatty acid added to the latex as soap solution is about a fortieth of that of untreated latex, but in the presence of both 1% fatty acid in the latex and 1% calcium chloride in the coagulant (both based on the rubber) it is only about a hundred and twentieth, the actual time being only a fraction of a minute.

The order of admixture of these materials is subject to some variation. For instance, if an electrolyte is used it may be added to the latex separately from the acid, but the most rapid and uniform coagulation is secured by adding the solution of coalescence-accelerator to the latex (which materially dilutes the latex), and dissolving the coagulant and electrolyte (if used) in the remaining dilution water, and then mixing these two liquids.

The latex may be coagulated at about the concentration at which it is obtained from the tree, but a considerable dilution, either of the latex directly or by means of the solution of the coalescence-accelerator or of the coagulant, contributes greatly to ease and completeness of mixing. This is particularly important in the process of this invention because of the rapidity with which coalescence sets in when coalescence-accelerators are used. Thus, the coalescence-accelerator may be dissolved in a volume of water half that of the latex to be treated, and mixed with the latex, and the acid may be mixed with a further quantity of water equal in volume to the latex thus diluted. A mixture of equal volumes of these liquids then brings about coagulation at a concentration of about 10 to 12% rubber.

The full advantages of this invention can be secured only by use of fresh latex, within a few hours of its collection. The storage of latex not only involves additional expense but requires the addition of preservatives which profoundly alter the properties of the latex. Thus ammonia in the proportions required for preservation changes the responsiveness of latex to the preferred coalescence-accelerators. Formaldehyde renders coalescence-accelerators less effective when used in proportions sufficient to preserve the fluidity of the latex for a considerable time, although a small proportion of formaldehyde amounting to not over 0.1% on the latex and capable of preserving the latex only for a day or two does not have a great effect. Even soap added to latex gradually loses some of its coalescence-accelerating effect, so that soap-containing latex after standing twenty-four hours may require the addition of further quantities of soap to bring about coalescence in the same short time as with freshly treated latex. Caustic soda has less effect and may be used if it is necessary to preserve the latex for a time before it is coagulated, but even with this preservative the minimum quantity requisite for the desired effect should be used, say 0.2% of the latex. Nevertheless, preserved latex may be employed if proper account is taken of the different length of time required for its coagulation, particularly if the coagulation is hastened by concurrent use of suitable electrolytes, for soluble salts of polyvalent metals, when added to the coagulant, greatly accelerate the coagulation of either fresh or preserved latex. This modification is particularly advantageous in the working up of the skim fraction of centrifugally concentrated latex or creamed latex.

As a specific example of one embodiment of the invention, an apparatus similar to that shown diagrammatically in the drawing accompanying the provisional specification may be used. Fresh Hevea latex in the tank 1 is mixed with a soap solution containing a quantity of soap equivalent to 1% of fatty acid based on the dry rubber content of the latex and the mixture is diluted to 4% dry rubber content. A volume of water equal to that of the diluted latex is placed in tank 2 and mixed with sufficient acetic acid to produce a 0.066% solution. The contents of the respective tanks are then withdrawn at the same rate through conduits 3 and 4 and introduced into the upper end of a long, slightly inclined trough 5, preferably about sixty feet long and of such inclination that the latex requires two minutes to flow to the lower end. The continuous flow of the two fluids from adjacent outlets into the trough ordinarily brings about adequate mixing, but if

desired baffles or other mixing devices may be used. The trough should be of a material to which the coagulum does not readily adhere, and should preferably be maintained wet further to reduce the possibility of adhesion. A porous material such as portland cement, concrete or wood will maintain itself sufficiently wet above the surface of the latex by capillary action, but this effect may be supplemented or replaced by fine sprays of water or by covering the trough to retard drying. Zinc metal is a very satisfactory material if care is taken to keep it well wet, but aluminium shows an undesirable tendency to adhere to the coagulum. An alternative which avoids difficulties in controlling the flow of latex and coagulum in an inclined trough is to make the trough of an endless belt of a flexible impervious material such as rubber or rubberized fabric which is folded into the shape of a horizontal trough by a suitable support. The belt is then moved continuously at the rate at which it is desired to have the latex and coagulum progress, and discharges the strip of coagulum to the squeeze rolls 9, while flow of the latex in the wrong direction is prevented by blocking the trough by a stationary dam which will permit the belt to slide past but will obstruct flow of liquids or by a relatively abrupt downward inclination of the moving belt just before it reaches the point of discharge of the liquids. The mixture of latex and acid has a dry rubber content of 2% and acidity corresponding to pH of about 4.6, and sets up as it flows down the trough. By the time it reaches the lower end it has coalesced to a continuous strip of coagulum having the same cross-sectional shape as the trough, and has begun to exude serum, but because of its extremely low rubber content it is very soft and tender. The strip of coagulum 6 is floated over an overflow lip 7 at the lower end of the trough and passes to a pervious belt 8 which carries it between a pair of squeeze rolls 9. Another pervious belt 10 is run on the upper surface of the coagulum as it traverses the squeeze rolls to assist in the expression of serum from the coagulum and to prevent undue distortion during this operation. This preliminary squeezing compacts and strengthens the coagulum sufficiently to permit its passage directly through a battery of sheeting rolls 11, 12, 13, 14, which further compact it and express most of the remaining serum. The coagulum is then washed in a tank 15 for about five minutes, then is dried, preferably in a continuous forced draught drier 16.

The product is a light coloured, translucent, continuous sheet of rubber indistinguishable in most of its properties (other than its obvious difference in shape) from first latex crepe. It may be cut up into sheets for baling or crating or may be rolled into cylindrical rolls as may be preferred.

The process may be carried out in other manners than that specifically described above. For example, the latex and acid may be diluted only sufficiently to give a coagulum of 10% dry rubber instead of 2% as above, but in this case the same extremely low water absorptive capacity will not be attained.

Other coalescence-accelerators may likewise be employed with similar results. For example, the sodium salt of beta-naphthol gives the same rapid coalescence as soap when used in the same proportion.

If desired, the strip of coagulum from the trough may be cut into sheets which may be individually sheeted and dried.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:—

1. A continuous method of treating Hevea latex to obtain crude rubber continuously therefrom, which comprises continuously intermixing, in the presence of a coalescence-accelerator which is a water-soluble salt of a substantially water-insoluble organic acid, a stream of Hevea latex and a stream of a dilute acid coagulant sufficient to bring the mixture to a pH not over 5, and removing the resulting coagulum as a continuous strip.

2. A method according to claim 1, in which said admixture is effected in the presence of a soluble salt of a polyvalent metal.

3. A method according to claim 1 or 2, in which fresh Hevea latex is used, preferably within a few hours of its collection.

4. A method according to any of the preceding claims, in which the Hevea latex is considerably diluted either before or during the treatment thereof.

5. A method according to any of the preceding claims, in which the coalescence-accelerator, preferably in aqueous solution, is initially mixed with the Hevea latex, a stream of said mixture then being intermixed with a stream of said dilute acid coagulant.

6. A method according to any of the preceding claims, in which said coalescence-accelerator is a water-soluble soap.

7. A method according to any of the preceding claims, in which the intermixture is flowed along a shaped conduit to produce a shaped continuous strip of coagulum.

desired baffles or other mixing devices may be used. The trough should be of a material to which the coagulum does not readily adhere, and should preferably be maintained wet further to reduce the possibility of adhesion. A porous material such as portland cement, concrete or wood will maintain itself sufficiently wet above the surface of the latex by capillary action, but this effect may be supplemented or replaced by fine sprays of water or by covering the trough to retard drying. Zinc metal is a very satisfactory material if care is taken to keep it well wet, but aluminium shows an undesirable tendency to adhere to the coagulum. An alternative which avoids difficulties in controlling the flow of latex and coagulum in an inclined trough is to make the trough of an endless belt of a flexible impervious material such as rubber or rubberized fabric which is folded into the shape of a horizontal trough by a suitable support. The belt is then moved continuously at the rate at which it is desired to have the latex and coagulum progress, and discharges the strip of coagulum to the squeeze rolls 9, while flow of the latex in the wrong direction is prevented by blocking the trough by a stationary dam which will permit the belt to slide past but will obstruct flow of liquids or by a relatively abrupt downward inclination of the moving belt just before it reaches the point of discharge of the liquids. The mixture of latex and acid has a dry rubber content of 2% and acidity corresponding to pH of about 4.6, and sets up as it flows down the trough. By the time it reaches the lower end it has coalesced to a continuous strip of coagulum having the same cross-sectional shape as the trough, and has begun to exude serum, but because of its extremely low rubber content it is very soft and tender. The strip of coagulum 6 is floated over an overflow lip 7 at the lower end of the trough and passes to a pervious belt 8 which carries it between a pair of squeeze rolls 9. Another pervious belt 10 is run on the upper surface of the coagulum as it traverses the squeeze rolls to assist in the expression of serum from the coagulum and to prevent undue distortion during this operation. This preliminary squeezing compacts and strengthens the coagulum sufficiently to permit its passage directly through a battery of sheeting rolls 11, 12, 13, 14, which further compact it and express most of the remaining serum. The coagulum is then washed in a tank 15 for about five minutes, then is dried, preferably in a continuous forced draught drier 16.

The product is a light coloured, translucent, continuous sheet of rubber indistinguishable in most of its properties (other than its obvious difference in shape) from first latex crepe. It may be cut up into sheets for baling or crating or may be rolled into cylindrical rolls as may be preferred.

The process may be carried out in other manners than that specifically described above. For example, the latex and acid may be diluted only sufficiently to give a coagulum of 10% dry rubber instead of 2% as above, but in this case the same extremely low water absorptive capacity will not be attained.

Other coalescence-accelerators may likewise be employed with similar results. For example, the sodium salt of beta-naphthol gives the same rapid coalescence as soap when used in the same proportion.

If desired, the strip of coagulum from the trough may be cut into sheets which may be individually sheeted and dried.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:—

1. A continuous method of treating Hevea latex to obtain crude rubber continuously therefrom, which comprises continuously intermixing, in the presence of a coalescence-accelerator which is a water-soluble salt of a substantially water-insoluble organic acid, a stream of Hevea latex and a stream of a dilute acid coagulant sufficient to bring the mixture to a pH not over 5, and removing the resulting coagulum as a continuous strip.

2. A method according to claim 1, in which said admixture is effected in the presence of a soluble salt of a polyvalent metal.

3. A method according to claim 1 or 2, in which fresh Hevea latex is used, preferably within a few hours of its collection.

4. A method according to any of the preceding claims, in which the Hevea latex is considerably diluted either before or during the treatment thereof.

5. A method according to any of the preceding claims, in which the coalescence-accelerator, preferably in aqueous solution, is initially mixed with the Hevea latex, a stream of said mixture then being intermixed with a stream of said dilute acid coagulant.

6. A method according to any of the preceding claims, in which said coalescence-accelerator is a water-soluble soap.

7. A method according to any of the preceding claims, in which the intermixture is flowed along a shaped conduit to produce a shaped continuous strip of coagulum.

8. A method according to any of the preceding claims, which includes pressing the coagulum, and then washing and drying it.

9. A continuous method of treating Hevea latex to obtain crude rubber continuously therefrom, substantially as hereinbefore described.

10. Crude rubber whenever obtained by the method according to any of the preceding claims.

Dated this 27th day of March, 1940.

CRUIKSHANK & FAIRWEATHER,
65—66, Chancery Lane, London, W.C.2,
and 29, St. Vincent Place, Glasgow,
Agents for the Applicant.

Leamington Spa: Printed for His Majesty's Stationery Office, by the Courier Press.—1941.