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PATENT SPECIFICATION

NO DRAWINGS

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COMPLETE SPECIFICATION

Improvements in or relating to the processing of Natural Rubber



We, THE BOARD OF THE RUBBER RESEARCH INSTITUTE OF MALAYA, of 3rd Mile Ampang Road, Kuala Lumpur, Malaysia, (formerly of Malaya), a Body Corporate of Malaysia, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to the processing of natural rubber and in particular provides a process for the production of rubber in crumbled form.

In our copending Application No. 18723/64, Serial No. 1075234 we have described a method of processing natural rubber which comprises milling a masterbatch consisting of a wet coagulum of a natural or synthetic rubber latex having a compatible oil dispersed therein with wet natural rubber in the form of a wet coagulum or solid mass, the milling being continued until the rubber crumbles.

We have now discovered that when oils which are incompatible with rubber are added in small proportions directly to wet rubber on a crepeing mill, the rubber crumbles. The use of incompatible oils for crumbling of rubber has the advantage, as compared with the use of compatible oils, that the crumbled rubber does not knit back to a crepe even on repeated milling or on standing.

An incompatible oil is defined herein as an oil which is absorbed by unvulcanised natural rubber to an extent of less than 20% by weight of the rubber in twentyfour hours at 30°C.

Because only a small proportion of an incompatible oil is necessary to effect the desired crumbling of the rubber, the incorporation of the oil in the rubber on the crepeing mill need not be a messy operation and can be effected in this way quite readily.

We have further found that, in spite of the

incompatibility of the oils with rubber, it is possible to produce a mixture of an incompatible oil with rubber by admixing the oil in the form of an aqueous dispersion or emulsion with natural rubber latex and then coagulating the resultant mixture. This coagulated mixture, on milling, breaks down into crumbled rubber in the same way as when the oil is directly added to the rubber on the mill.

According to the present invention there is provided a process for the production of rubber in crumbled form which comprises milling a mixture of an incompatible oil, as hereinbefore defined, and wet natural rubber in the form of a latex coagulum or solid mass at least until the mixture crumbles.

Some incompatible oils which may be used in the practice of the present invention may have a greasy consistency at normal ambient temperatures and it will be understood that the term "oil" as used herein includes such greases.

It will be appreciated that where the mixture of oil and rubber is obtained by addition of the oil to rubber latex, the oil may either be dispersed or emulsified directly into the latex or made up separately as an aqueous dispersion or emulsion which is then admixed with the rubber latex.

As indicated above a crumbling effect may be obtained by the incorporation of relatively small proportions of the oil into the rubber. In the case of castor oil, for example, the minimum concentration of oil necessary to effect a satisfactory degree of crumbling is about 0.5% by weight of the rubber on the dry basis, while with silicone grease a similar result can be achieved with as little as 0.25% by weight of the rubber.

The resulting rubber crumbs have a fine particle size and for this reason they can be dried rapidly for example by passing heated air through a bed of the rubber crumbs.

[Price 4s. 6d.]

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Where the oil is added directly to the rubber on the mill the process of the present invention may be carried out with latex coagulum, crepe or sheet rubber and is equally applicable to the lower grades of rubber, such as cup lump and tree scrap.

The following Examples will serve to illustrate the manner in which the crumbling of rubber may be carried into effect in accordance with the invention:—

EXAMPLE I

Wet natural rubber latex coagulum was creped once on a crepeing mill and divided into batches. Different amounts of castor oil or silicone grease were added to the surface of each batch and the batches were passed through a crepeing mill five or six times and dried by blowing air at 100°C. through a four inches thick bed of the rubber for 1½ to 2 hours. The nature of the resultant rubber in each case is given in the following Table:—

TABLE I

Concentration and nature of oil by weight of rubber on dry basis	Nature of rubber after crepeing
0.25% silicone grease	Fine crumbs
0.25% Castor oil	Large crumbs
0.5% " "	Fine crumbs
1.0% " "	" "
2.0% " "	" "

EXAMPLE II

An aqueous dispersion of castor oil was admixed with batches of fresh latex to form a series of mixtures having different concentrations of castor oil and the mixtures were

separately coagulated with formic acid. Each coagulum was given four passes on a crepeing mill. The nature of the resultant rubber in each case is recorded in the following table:—

TABLE II

Concentration of castor oil by weight of rubber on dry basis	Nature of rubber after crepeing
0.25% Castor oil	Very brittle crepe
0.5% " "	large crumbs
0.7% " "	fine crumbs
1.0% " "	fine crumbs

The incorporation of incompatible oils into rubber in the proportions necessary to effect crumbling does not adversely affect the physical properties of the rubber to any significant extent and the following comparative tests indicate the properties of representative crumbled rubbers produced in accordance

with the invention as compared with an untreated rubber.

Two crumbled rubbers containing 0.5% and 1% respectively of castor oil and prepared as described in Example 1 were compounded according to the following recipe and vulcanised.

Rubber	=	100 parts by weight
Stearic acid	=	0.5 " " "
Mercaptobenzthiazole	=	0.5 " " "
Zinc oxide	=	6.0 " " "
Sulphur	=	3.5 " " "

A control creped rubber containing no oil was compounded according to the same recipe and vulcanised.

The properties of the rubbers are given in Table III below:—

TABLE III

% of oil in rubber	Tensile strength lbs./sq. in.	Elongation at break %	Modulus 300% lbs./sq. in.	Hardness BS°	Resilience %
Control	2731	849	213	40.5	85.5
0.5% Castor Oil	2731	848	213	40.4	86.3
1% Castor Oil	3016	864	213	39.0	86.7

As will be seen from Table III, the incorporation of up to 1% castor oil into natural rubber leaves the physical properties of the rubber substantially unaltered, although it will be noted that some of the properties, particularly tensile strength, are slightly improved.

WHAT WE CLAIM IS:—

1. A process for the production of rubber in crumbled form which comprises milling a mixture of an incompatible oil, as hereinbefore defined, and wet natural rubber in the form of a latex coagulum or solid mass at least until the mixture crumbles.

2. A process according to claim 1 wherein the mixture of oil and rubber is obtained by admixing the oil in the form of an aqueous dispersion or emulsion with natural rubber latex and then coagulating the resultant mixture.

3. A process according to claim 2 wherein the oil is dispersed or emulsified directly into the latex.

4. A process according to claim 1 wherein

the oil is added directly to the rubber on a crepeing mill.

5. A process according to any of the preceding claims wherein the crumbled rubber is dried by passing heated air through a bed of the rubber crumbs.

6. A process according to any of the preceding claims wherein the oil is incorporated into the rubber in an amount of from 0.25% to 2% by weight.

7. A process according to any of the preceding claims wherein the oil is castor oil or silicone grease.

8. A process for the production of rubber in crumbled form substantially as described with reference to the Examples.

9. Crumbled rubber when produced by the process claimed in any of the preceding claims.

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Agents for the Applicants.

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