Cl. 260

Published Apr. 20, 1943

Serial No. 412,892

# ALIEN PROPERTY CUSTODIAN

## METHOD OF PRODUCING MIXTURES OF POLYSTYRENE WITH NATURAL OR SYNTHETIC RUBBER

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No Drawing. Application filed September 29, 1941

This invention relates to a method of producing mixtures of polysyrene with natural or synthetic rubber.

The mixture of polystyrene with india-rubber must be effected at a temperature lying above the softening point of polystyrene, since otherwise the polystyrene cannot be homogeneously distributed within the india-rubber. It has been found that the mixtures thus produced after cutting off the skin from the hot roller and when cooled are hard and brittle and break at room temperature.

Tests have surprisingly shown that the mixture becomes again flexible and supple and maintains these properties, if it is, for instance, subsequently subjected to a cold rolling.

According to the invention the constituents when producing mixtures of polystyrene with natural or synthetic rubber are therefore first mixed at a temperature lying above the softening point of the polystyrene and the mixture when cooled is subjected to a further deformation, particularly on cold rollers at a temperature below the softening point of polystyrene.

The invention is of particular importance for the production of synthetic rubber mixtures, in which case by synthetic rubber are to be understood particularly the artificial substances containing polymers and interpolymers of butadiene and its derivates.

For different electro-engineering purposes, such as, for instance, for the insulation of conductors serving to transmit high-frequency alternating currents, so-called para-mixtures have hitherto been employed, i. e., india-rubber mixtures which do not have an organic loading and whose percentage of india-rubber varies approximately from 80 to 95%. Such mixtures cannot be produced with synthetic rubber, since mixtures having such a high percentage of synthetic rubber owing to their great toughness cannot be calendered and not even applied to conductors with the aid of the extrusion press.

In order that this may be possible, a considerable amount of softening agent had to be added to the synthetic rubber. However, the best softening agents as is well known are not satisfactory from a dielectric point of view. It is true that a softening of the synthetic rubber may be attained with the known softening agents; however, such mixtures cannot be calendered and extruded to obtain a completely smooth surface.

According to the invention it is possible to produce mixtures of synthetic rubber which meet all requirements both from a mechanical and dielectrical point of view.

Since the insulation of electric conductors produced from such mixtures must be vulcanized and since the temperature at which the vulcanization is effected lies above the softening point of the normal polystyrene, the rolled or extruded mixture would thereby become again brittle. According to the invention a highly molecular polystyrene whose softening point lies above the vulcanizing temperature is employed for the production of vulcanizable mixtures of polystyrene with synthetic rubber. To this end, above all, types of polystyrene with a K-value of 100 and over are employed, such as are, for instance, obtainable under the trade name "polystyrene EF".

Such vulcanizable mixtures according to the invention which preferably contain 25 to 100 parts by weight of a highly molecular polystyrene having a softening point of about 175 degrees centigrade and 100 parts of synthetic rubber may be very easily calendered into a smooth sheet or extruded so as to apply a smooth insulation covering on conductors and are characterized by very low values of the dielectric losses and of the dielectric constant. Only the vulcanizing agents and vulcanization accelerators necessary therefor are preferably added to the mixture. Under circumstances further small amounts of softening agents adapted for insulation purposes, such as coumarone resin, liquid butadiene polymers, fatty acids, paraffin or the like may, however, be added thereto.

Another field of application for which the invention is of great importance is the production of soft rubber parts for sealing purposes and the like which should be particularly soft and elastic. To this end, rubber regenerates alone or mixed with another substance are also employed to a great extent which behave in a similar manner as synthetic rubber as regards the capability of being calendered into a smooth sheet or so extruded as to apply a smooth insulation covering on conductors. Such mixtures must often be capable of being extruded or calendered and vulcanized without the use of molds, in which case neat and smooth surfaces are necessary. While mixtures consisting of synthetic rubber or rubber regenerate do not fulfil both conditions, it is possible according to the invention to considerably improve the mixture by adding small amounts, for instance, only 1 to 5% of a polystyrene having a softening point lying above the vulcanizing temperature so that it may be easily calendered or extruded without impairing the quality of the final product.

Thus, it is possible, for instance, by adding 1% of a highly molecular polystyrene in form of a polystyrene-rubber batch to a mixture difficult to calender and containing 20% synthetic rubber and 40% rubber regenerate to improve the properties of the mixture to such an extent that it may be calendered into sheets or extruded into tubes whose surfaces are perfectly smooth.

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