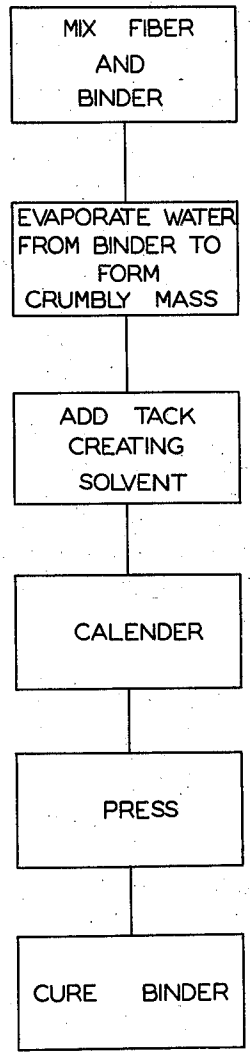
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METHOD OF MAKING SHEET GASKET MATERIAL

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METHOD OF MAKING SHEET GASKET MATERIAL

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This invention relates to a method of making gasket material and, more particularly, to a method of making sheets of inorganic fibrous material from which gaskets of desired size and shape may be blanked or died.

Heretofore, for example, gasket material has been made by mixing asbestos fibers and a rubber solution together, then sheeting the mass on rolls until the solvent of the rubber solution has evaporated, then, die cutting or blanking the sheet so formed into gaskets of desired configuration. Such method possesses numerous disadvantages. Particularly heavy mixing equipment is required; the solvent is lost by evaporation unless solvent recovery equipment is provided, and the provision of solvent recovery equipment materially increases the investment. A disadvantage of the method resides in the fact that the atmosphere surrounding the operation becomes solvent-laden. Rubber solvents, generally speaking, which may be used economically, are highly inflammable. Consequently, a tremendous fire hazard is present during practice of the process. In addition, it has been noted the solvent-laden atmosphere, surrounding the operation deleteriously affects the operators. These inherent disadvantages all lead to the conclusion that the process is undesirable due to its expense, hazards, and deleterious effects upon workmen.

The chief object of my invention is to provide a method of making gasket material which eliminates the inherent defects and deficiencies of prior processes. An object of my invention is to provide an economical method of making sheet gasket material which does not involve a tremendous investment in mixing equipment or entail the hazards contingent upon the evaporation of inflammable solvents during practice of the process. A further object is to provide an economical method of making sheet gasket material in which the use of highly inflammable solvents is obviated. A still further object is to provide a method of making a sheet gasket material in which the fibers are coated with binder and formed into a sheet without the use of an inflammable solvent. A still further object is to provide an intermediate product readily convertible into a sheet of gasket material.

The present invention relates to a method of making sheet gasket material in which the steps comprise mixing inorganic fibers, such as asbestos fibers with a binder material in the form of latex or a water dispersion, and eliminating or evaporating the water to provide a substantially dry, crumbly mix of asbestos fibers substantially

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coated with binder. The dry, crumbly mix is then, preferably, moistened slightly with a material capable of rendering the binder tacky or slightly adhesive and the mix sheeted by means of an ordinary rubber mill or in any other suitable manner. It will be appreciated the mill sheeting operation may cure the binder to some extent. Sheets so formed are then placed in a flat press and heated to provide a desired smooth finish on the sheet and to further cure the binder. Gaskets of desired size and shape may be blanked, stamped, or die cut from the sheet so formed.

Various binders may be used provided they are readily suspended or dispersed in a non-inflammable inexpensive carrier, such as water. I have found most satisfactory results may be secured with a binder of synthetic rubber, such as butadiene acrylonitrile copolymer, for example, "Hycar," or polymerized chloroprene, such as "Neoprene." Other binders may be used if desired, for example, butadiene-styrene copolymer, rubber, "Thiokol" (ethylene tetrasulfide), "Butyl" rubber, natural or synthetic resins, such as urea-aldehyde resin, phenol-aldehyde resin, melamine-aldehyde resin, Vinylite (vinyl chloride-vinyl acetate copolymer), copal, rosin, and the like. The material used to render the binder tacky or adhesive varies, of course, depending upon the type of binder used in the practice of my invention. When acrylonitrile butadiene copolymers are used as the binder material, I have found that Cellosolve acetate (ethylene glycol monoethyl ether acetate) performs satisfactorily as a material capable of rendering the binder tacky or adhesive and which may be readily removed when the mix is sheeted on a rubber mill. Such material need not be removable from the mix but if desired, a material may be used which remains in the final product. When polymerized chloroprene is used as the binder material, I prefer that toluol be used as the tack-imparting material.

This invention further relates to an intermediate product for use in the manufacture of sheet gasket material which includes a substantially dry, crumbly residue of a mixture of asbestos fibers and a binder material suspended or dispersed in water, the residue being in the form of crumbs and being coated or moistened with a material which may or may not be volatile adapted to render the binder tacky or adhesive at least on the external surfaces of the crumbs. The term "volatile" as used herein characterizes a material which may be added to the dry, crumbly mix to render the binder tacky or adhesive to some extent and which is capable of evaporation

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or volatilization during the sheeting operation to remove tackiness from the binder.

The attached drawing is a flow diagram of the processing steps involved in carrying out the preferred method of this invention.

To more clearly illustrate my invention, I will describe it with particular reference to the following examples:

	Parts by weight
Asbestos fibers	45
Water	120
Ammonium hydroxide	5
Aerosol OT (20%)	10
Vulcanizing dispersion	1.1
Dibutyl phthalate	3
Acrylonitrile butadiene copolymer latex (40%)	38

The above ingredients are thoroughly mixed together in a Baker-Perkins mixer or other suitable mixer and then after thorough mixing, the water is evaporated. The mix becomes substantially dry and crumb-like upon the evaporation of water. It will be appreciated the binder is not cured or vulcanized at this stage of the operation. The mixture preferably is brought to room temperature and approximately 10 parts by weight of Cellosolve acetate is then thoroughly dispersed over the surfaces of the dry, crumbly mix to moisten or wet the same. The Cellosolve acetate is adapted to render the acrylonitrile butadiene copolymer tacky or adhesive in order that the fibers may be more readily secured to one another during subsequent sheeting operations. The mix carrying the volatile tack-creating solvent for the binder is then placed in an ordinary rubber mill and is sheeted to at least partially cure the binder and to substantially evaporate the volatile Cellosolve acetate. The rough sheets so formed are then placed in a flat press. Pressure is applied to the sheet in an amount of about 12,000 pounds per square inch while it is heated at approximately 310° F. for approximately 5 minutes to smooth the surface of the sheet and to further cure the binder. The sheet material so formed may be severed into gaskets of desired size and shape. Addition of Cellosolve acetate to the asbestos binder mixture appears to increase the density of the mixture and to aid in interlocking of the asbestos fibers.

In the above composition, Aerosol (dioctyl ester of sodium sulfosuccinic acid) is used as a wetting or dispersing agent and as a protective agent to protect the latex from too rapid coagulation upon its addition to the asbestos fibers. Dibutyl phthalate is used as a plasticizer or softener for the acrylonitrile butadiene copolymer. The vulcanizing dispersion may be composed of the following ingredients in substantially the proportions given by weight:

	Parts by weight
Sulfur	3
Captax (mercaptobenzothiazole)	1.25
Tuads (tetramethylthiuramdisulfide)	0.25
Darvan #1 (polymerized sodium salts of alkyl naphthalene sulfonic acids)	0.18
Casein	0.05
Water	3.13

Other accelerators and dispersing agents may be used if desired and the above vulcanizing dispersion is merely representative of a large number of vulcanizing dispersions which may be used.

A satisfactory sheet gasket material may be made of the following ingredients, all proportions being given by weight:

	Parts by weight
Asbestos fibers (long)	100
Asbestos fibers (short)	30
Gastex (carbon black)	20
Water	100
Ammonium hydroxide	4.25
Cellosolve	13
Acrylonitrile butadiene copolymer latex (40%)	125
"Thiokol" emulsion (50%)	17.5
Vulcanizing dispersion	4.25

The above ingredients are thoroughly mixed together and the moisture is removed therefrom by means of heat. The heat is then discontinued, the mixture brought to room temperature, and about 35 cc. of Cellosolve acetate is added to render the binder tacky or adhesive. The Cellosolve acetate is thoroughly dispersed over the surfaces of the dry materials and the material is sheeted in a rubber mill. The sheets are removed from the rubber mill and placed in a flat press and cured at 310° F. for 5 minutes under a pressure of approximately 12,000 pounds per square inch. Gaskets of desired size and shape may be severed from the sheet so formed.

In the above composition, Gastex is used as a filler. Other fillers may be used, for example, clay or whiting. The vulcanizing dispersion may be formed similarly to the vulcanizing dispersion of Example 1. "Thiokol" is an ethylene tetrasulfide compound. The "Thiokol" emulsion may be formed of:

	Parts by weight
"Thiokol"	100
Water	63
Darvan #1	2
Casein (15%)	30
Bentonite clay slurry including 20% by weight of bentonite clay	5

Another example of a satisfactory compound for use in the formation of sheet gasket material is as follows:

	Parts by weight
Asbestos fibers (long)	600
Asbestos fibers (short)	300
Aerosol (20%)	80
Heavy pine tar (25%)	30
Vulcanizing dispersion	13
Acrylonitrile butadiene copolymer latex (40%)	300

The above ingredients are thoroughly mixed together and formed into sheets as disclosed above.

In the above examples, a volatile material adapted to render the binder tacky or adhesive may or may not be used in the manner described above. I have found that, generally, more satisfactory results may be obtained in the practice of my method if such a material be added in the manner disclosed. It is not essential, however, and may be omitted from any of the various compounds described above.

My invention provides numerous advantages. It obviates the use of inflammable solvents for the binder heretofore deemed necessary and obviates the use of heavy mixing equipment or solvent recovery equipment necessary when inflammable solvents are used. My invention may be readily practiced even by unskilled labor and provides an inexpensive, ready method of making sheet gasket material.

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While I have described and illustrated a preferred embodiment of my invention, it will be understood my invention is not limited thereto since it may be otherwise embodied within the scope of the following claims.

I claim:

1. In the method of making sheet gasket material, the steps which comprise mixing inorganic fibers with an aqueous dispersion of a heat curable binder material, evaporating substantially all the water from the mixture to form a substantially dry, crumbly mix, adding to said crumbly mix a tack-creating solvent for the binder, calendering the treated mix into a sheet, pressing the sheet at an elevated temperature to smooth the surface of the sheet, and curing the binder.

2. In the method of making sheet gasket material, the steps which comprise mixing asbestos fibers with an aqueous dispersion of a heat curable binder material, evaporating substantially all the water from the mixture to form a substantially dry, crumbly mix, adding to said crumbly mix a tack-creating solvent for the binder, calendering the treated mix into a sheet while partially curing the binder, pressing the sheet at an elevated temperature to smooth the surface of the sheet, and further curing the binder.

3. In the method of making sheet gasket material, the steps which comprise mixing asbestos fibers with an aqueous dispersion of a heat curable acrylonitrile butadiene copolymer and a vulcanizing agent therefor, evaporating substantially all the water from the mixture to form a substantially dry, crumbly mix, adding to said crumbly mix a tack-creating solvent for the binder, calendering the treated mix into a sheet while partially curing the binder, pressing the sheet at an elevated temperature to smooth the surface of the sheet, and further curing the binder.

4. In the method of making sheet gasket material, the steps which comprise mixing asbestos fibers with an aqueous dispersion of a heat curable polymerized chloroprene and a vulcanizing agent therefor, evaporating substantially all the water from the mixture to form a substantially dry, crumbly mix, adding to said crumbly mix a tack-creating solvent for the binder, calendering the treated mix into a sheet while partially curing the binder, pressing the sheet at an elevated temperature to smooth the surface of the sheet, and further curing the binder.

5. In the method of making sheet gasket material, the steps which comprise mixing asbestos fibers with an aqueous dispersion of a heat curable binder material, evaporating substantially all the water from the mixture to form a substantially dry, crumbly mix, adding to the dry mix a tack-creating solvent for the binder, forming the treated mix into a sheet, removing said solvent, and then curing said binder.

6. In the method of making sheet gasket material, the steps which comprise mixing asbestos fibers with an aqueous dispersion of a heat curable binder material, evaporating substantially all the water from the mixture to form a substantially dry, crumbly mix, moistening the dry mix with a solvent material adapted to render the binder tacky, forming the treated mix into a sheet, volatilizing said material, pressing the sheet at an elevated temperature to smooth the surface of the sheet and curing the binder.

7. In the method of making sheet gasket material, the steps which comprise mixing asbestos fibers with an aqueous dispersion of a heat curable acrylonitrile butadiene copolymer and a vulcanizing agent therefor, evaporating substantially all the water from the mixture to form a substantially dry, crumbly mix, moistening the dry mix with Cellosolve acetate to render the binder tacky, forming the treated mix into a sheet, evaporating said Cellosolve acetate, pressing the sheet at an elevated temperature to smooth the surface of the sheet, and curing the binder.

8. In the method of making sheet gasket material, the steps which comprise mixing asbestos fibers with an aqueous dispersion of a heat curable polymerized chloroprene and a vulcanizing agent therefor, evaporating substantially all the water from the mixture to form a substantially dry, crumbly mix, moistening the dry mix with toluol to render the binder tacky, forming the treated mix into a sheet, evaporating the toluol, pressing the sheet at an elevated temperature to smooth the surface of the sheet, and curing the binder.

RICHARD ALMY.

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