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ROOM-TEMPERATURE VULCANIZABLE SILICONE RUBBER STOCKS

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ABSTRACT OF THE DISCLOSURE

A silicone rubber stock curable at room-temperature is based on a diorganosiloxane polymer prepared by reacting a hydroxyl endblocked diorganosiloxane polymer with a diacyloxydiorganosilane admixed with a triacyloxy silicon compound and is useful over the broad range of sealants and coatings, wherein RTV silicone rubbers are presently employed.

Background of the invention

This invention is in the field of room-temperature vulcanizing (RTV) silicone elastomer materials and introduces a novel polymer-crosslinking system.

The recent developments in room-temperature vulcanizing silicone rubber stocks have been directed to both the polymer employed and the curing catalysts and crosslinking agents. In general, it is known that certain siloxane polymers having reactive groups bonded to silicon are chemically active toward crosslinking agents in the presence of certain catalysts. These materials cure spontaneously upon mixing and cannot be stored and marketed in a single package hence they are called two-component RTV silicone rubber stocks. In contrast, it is also known that certain siloxanes, particularly hydroxyl endblocked dimethylsiloxanes, can be admixed with certain trifunctional silanes such as alkyltriacyloxysilanes and the mixture is stable until it is exposed to water such as atmospheric water vapor whereupon the material will cure. These materials can be packaged in a single package and do not require further processing by the ultimate consumer and are known as one-component RTV silicone rubber stocks. The present invention is directed to a one-component RTV silicone rubber stock.

The known one-component RTV silicone rubber stocks include mixtures of diorganopolysiloxanes having reactive endgroups or endblockers and acyloxy substituted organic silicon compounds having at least three acyloxy groups per molecule. These mixtures are known as "acyloxy one-component systems." The acyloxy one-component systems have heretofore suffered the disadvantage of short storage life unless measures are taken to exclude water from the ingredients and storage package. The expense incurred in drying fillers and other ingredients has proved bothersome in the commercial exploitation of the acyloxy one-component systems. An alternative to the use of predried ingredients is the incorporation of anhydrides of aliphatically saturated carboxylic acids to the acyloxy one-component RTV stock. However, this often produces corrosion of metal substrates which come in contact with the RTV stock. Other disadvantages of the acyloxy one-component systems have included indifferent adhesion to substrates, relatively poor tear strength and the impossibility of preparing such a system which would cure to form a transparent elastomer.

The object of this invention is to introduce a new room-temperature vulcanizing silicone rubber composition. A further object is to introduce an acyloxy one-component

RTV stock which is less sensitive to the presence of moisture during storage. A further object is an acyloxy one-component RTV silicone rubber system exhibiting good adhesion to substrates, good tear resistance and suitable for use in preparing transparent elastomeric products. Other objects and advantages of this invention are detailed in or will be apparent from the disclosure and claims following.

Summary of invention

This invention relates to a one-component room temperature vulcanizable silicone rubber stock which can be stored in the substantial absence of moisture and cures in the presence of water vapor characterized in that the stock is a mixture of (A) a diorganopolysiloxane prepared by reacting (1) a hydroxyl-endblocked diorganopolysiloxane with (2) an acyloxy substituted organosilicon compound of the general formula $R_2Si(OOCR')_2$, wherein each R is a monovalent hydrocarbon radical, halogenohydrocarbon radical or cyanoalkyl radical and each R' is a hydrogen atom or a monovalent hydrocarbon radical free of aliphatic unsaturation (B) acyloxy substituted organosilicon compound having at least three acyloxy groups per molecule.

Detailed description of invention

The organopolysiloxanes employed herein are well-known articles of commerce fully described in the prior art in such patents as U.S. Patents Nos. 2,843,555; 3,105,061 and 3,127,363 and 3,294,732. These organopolysiloxanes are essentially linear polymers having hydroxyl endblockers and can be represented by the general formula

$$(HO)_x\left(R_ySiO_{\frac{4-y}{2}}\right)_nH$$

wherein x has an average value of 0.99 to 1.01, y has an average value of 1.99 to 2.01 and $x+y$ is 3.0, each R is a monovalent hydrocarbon, halogenohydrocarbon or cyanoalkyl radical and n has a value of at least 3 and preferably at least 50 and does not exceed about 2,000.

The operable siloxane polymers are essentially linear hence are predominantly (i.e. at least 90 mol percent) R_2SiO units. However, limited proportions, preferably below 5 mol percent and most preferably below 2 mol percent of $RSiO_{3/2}$ units, $R_3SiO_{1/2}$ units and/or $SiO_{4/2}$ units can be present. The closer the polymer approaches the R/Si ratio of 2.0/1 the better the ultimate product with the exception that a softer cured rubber essentially free of extractable, uncured polymeric material can be obtained by admixing diorganofunctional siloxane polymers having a functional group on each of the terminal silicon atoms with monofunctional siloxane polymers having a functional group on one of the terminal silicon atoms and the other terminal group being an $R_3SiO_{1/2}$ unit.

In the formulae above, each R can be a monovalent hydrocarbon radical of up to 36 acrbon atoms. Best results are achieved with hydrocarbon substituents of 1 to 18 carbon atoms. Examples of the radicals represented by R include alkyl radicals such as methyl, ethyl, n-propyl, isopropyl, dodecyl, octadecyl and myricyl, ($-C_aH_{2a+1}$ where a is 1 to 36); alkenyl radicals such as vinyl, allyl, hexenyl and octadecenyl; cycloalkyl radicals such as cyclobutyl, cyclopentyl, cyclohexyl and cyclooctadecyl; cycloalkenyl radicals such as cyclobutenyl, cyclopentenyl, cyclohexenyl and cyclooctadecenyl; aryl radicals such as phenyl, xenyl, naphthyl and phenanthryl, aralkyl radicals such as benzl, β-phenylethyl and xylyl; and alkaryl radicals such as tolyl and ethylphenyl.

The substituted hydrocarbon radicals represented by R include halogenohydrocarbon radicals such as o-, m-