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COATING COMPOSITION COMPRISING A POLYVINYL ACETAL, A MELAMINE-ALDEHYDE RESIN AND A POLYURETHANE, PROCESS FOR PREPARING SAME, AND ELECTRICAL CONDUCTOR COATED THEREWITH

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This invention relates to polyvinyl acetal compositions especially adapted to serve as electrical insulation for metals. More particularly, the invention relates to compositions of polyvinyl acetals reacted with certain polyurethanes and melamine resins and to wires coated with these compositions.

Polyvinyl acetals modified with phenolic resins are well known, being used extensively as coatings in various applications such as can linings and as electrical insulation. They are also used as structural adhesives, particularly as taught by de Bruyne in U.S. Patent 2,499,134. A delicate balance of many varied properties is required for these applications and much work has been done to improve the characteristics desired since the formulations were first shown by Jackson and Hall in U.S. Patent 2,307,588.

Some recent work is disclosed by Daszewski in U.S. Patent 2,730,466, Emig et al. in U.S. Patent 2,668,157 and Anderson in U.S. Patent 2,574,313. Most of the new compositions have included extremely minor amounts of various additives to improve the preferred commercial compositions comprising generally 100 parts of polyvinyl acetal and 50 parts of phenolic resin.

The polyvinyl acetals have also been reacted with certain polyurethanes, such as taught in Australian Patent 206,454, issued February 20, 1957.

Although the above mentioned compositions have been satisfactory as insulative coatings possessing the required thermal and solvent resistance necessary in certain instances, they have failed to possess all of the many varied properties required for insualtion in hermetically sealed motors for application in which monochlorodifluoromethane (Refrigerant–22) is commonly used as a refrigerant. To meet commercial acceptance in this application it is required that the solvent resistance of the coating to the liquid refrigerant when measured by the extractibles from the coating, be less than 1%. It is further required that the solvent resistance of the coating to other common solvents, for example toluene and methanol again as measured by extractibles, be also in such minor amounts. In other properties such as dielectric strength, dielectric life at elevated temperatures, abrasion resistance, cut through temperature, thermal shock and flexibility there are specified minimum values below which the particular coating will not be commercially acceptable. The applicants have found, unexpectedly, that certain modified polyvinyl formal compositions possess the necessary improved solvent resistance to toluene, methanol and chlorodifluoromethane along with the other required properties for commercial acceptance.

An object of this invention is to provide crosslinked polyvinyl acetal compositions with improved resistance to various organic solvents, particularly monochlorodifluoromethane.

Another object is to provide coating compositions with improved stability as measured by loss of flexibility and dielectric strength after thermal aging.

A particular object of this invention is to provide improved wire enamels for use as electrical insulation.

These and other objects are obtained with coating compositions comprising, 100 parts polyvinyl acetal, 20–200 parts of a polyurethane and 0.5–20 parts of a melamine resin.

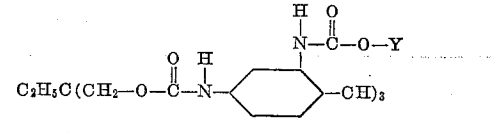
This inveniton is illustrated in its preferred embodiment in the following examples and subsequent discussions thereon, but is not limited thereto. Where parts and percentages are shown hereinafter in the specification and in the claims, they are parts and percentages by weight unless otherwise specified.

EXAMPLE 1

A polyvinyl formal resin was used having the following analysis:

10½% acetate groups calculated as polyvinyl acetate
6% hydroxyl groups calculated as polyvinyl alcohol
83½% formal groups calculated as polyvinyl formal (by difference)

100 parts of this resin together with 60 parts of a polyurethane represented by the formula



where Y is a phenyl group, along with 10 parts of a melamine-formaldehyde condensate resin, added as a 67 percent solution in butanol, were added to a solvent mixture comprising 440 parts of naphtha and 255 parts of cresylic acid. The resin additions were made in a suitable container at room temperature with moderate agitation. An amber colored solution was obtained having a total solids of approximately 18 percent and a viscosity of 50 poises at 25° C.

Six coats of this enamel were applied to No. 18 magnet wire by running the wire through the solution by conventional means. After each coating, the wire was passed through a vertical oven 12 feet high at a speed of approximately 14 feet per minute, the hottest portion of the oven being approximately 4 feet long and having a temperature of about 350° C. The increase in thickness of the wire due to the insulative coating was approximately 2.9 mils total build. Enameled wires were pre-