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CORK COMPOSITION

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The present invention relates to cork compositions of the type containing the cork in the form of particles held together by a binder into a solid plastic mass.

In Schnabel and Dangelmajer application Serial No. 268,754, filed April 19, 1939, polyvinyl alcohol compositions of improved plasticity are described which, while making use in the usual manner of a solvent for the polvinyl alcohol, are essentially characterized by their use of this solvent in conjunction with dispersed particles of substantially non-volatile organic substances substantially incapable of dissolving in the solvent or of dissolving the polyvinyl alcohol. These substances in their dispersed state produce a plasticizing effect which can be regarded as in the nature of an internal lubrication of the entire mass of material plasticized. The solvent for the polyvinyl alcohol is required in these compositions, but the need of retaining it is considerably reduced by the insoluble organic substances employed in a state of dispersion. The term "mechanical plasticizers" has appropriately been applied to these dispersed insoluble substances to distinguish them from the usual plasticizers employed in a state of solution in polyvinyl alcohol compositions.

It has now been found that compositions of improved utility, adaptable for use in a wide range of applications, may be made by combining cork particles with polyvinyl alcohol compositions which contain mechanical plasticizers. Polyvinyl alcohol, thus plasticized, has been discovered to be an excellent binder for cork particles and at the same time the inclusion of the cork has been found to improve the physical characteristics of the polyvinyl alcohol composition in a number of respects. Plasticized polyvinyl alcohol is flexible, resilient and somewhat elastic, but when subjected to continued pressure has a tendency to cold-flow or take on a permanent set. By incorporating cork particles in the composition this tendency is decreased and the resiliency is greatly improved. The inclusion of cork also minimizes the weight of the product and improves its resistance to elevated temperatures. Moreover, since polyvinyl alcohol is relatively expensive, the cost of the final product is much less when cork is included in substantial amounts.

The use of the aforementioned polyvinyl alcohol compositions as the binder for cork particles is particularly advantageous because the binder itself, in addition to being flexible, elastic and resilient, is unaffected by oils, fluid fuels and most organic solvents. The products of the invention are therefore particularly useful where they come in contact with such liquids. as for example, in fuel supply systems and in the handling of solvents.

The cork compositions of the invention are suited generally for the manufacture of gaskets, packings and washers. They may be used as blankets for the printing industry, as resilient supports for machinery, as bottle cap liners, as valve seats of the washer type, and many other items having a wide variety of shapes and sizes.

A wide variety of materials are available for use as the mechanical plasticizers to be contained in the polyvinyl alcohol binding compositions employed in accordance with the invention. Oils and fats of various types may be thus used. Other materials include various natural and synthetic hydrocarbons and their polymers, the higher fatty acids and their esters, the esters of various other acids, the higher alcohols, and various compounds of the terpene group. Even such materials as natural and artificial resins and rubbers may be used.

In view of the pronounced hydrophobic properties of oils, however, these are particularly well qualified for use in the polyvinyl alcohol binding compositions. The type of oil used is of no great importance. Oils of mineral, vegetable, or animal origin may be used. They may be non-drying, such as sesame oil or peanut oil; or semi-drying, such as castor oil; or drying, such as linseed oil or wood oil. Oxidized or unoxidized oils may be used, as well as polymerized oils.

The solvent for the polyvinyl alcohol in the binding compositions employed by the invention may consist of a single substance, such as water alone, formamide alone, etc., or of a mixture of substances, such as water and formamide, water and glycerine, etc., it being understood that it may include any of the soluble organic substances commonly used for obtaining plasticity in polyvinyl alcohol compositions.

The binding compositions employed by the invention are not restricted to the use of a single mechanical plasticizer. In this connection it should be noted that the use of miscible substances results in their being dispersed in admixture with one another, while the use of immiscible substances results in their being dispersed independently of one another. The binding compositions employed by the invention may thus contain a plurality of mechanical plasticizers, each of which may consist of one or more of the organic substances referred to above.

In producing the products of the invention, the insoluble substance or substances which are to constitute the mechanical plasticizing means in the binder for the cork particles may first be emulsified in the solvent for the polyvinyl alcohol. Where water is the solvent, this emulsion may be produced by employing a small amount of polyvinyl alcohol as an emulsifying agent, although other emulsifying substances may be used, such as Irish moss, Turkey-red oil, amine soaps etc. Subsequent to this emulsification, the de-

sired proportions of cork particles and polyvinyl alcohol may then be thoroughly admixed with the emulsion, it being noted in this connection that polyvinyl alcohol is normally a powder, in which state it may be used for this admixture. The result is thus an intimate mixture of emulsion moistened particles of cork and polyvinyl alcohol, which may then be reduced into a shapable plastic mass in various ways, as by mastication through rollers, kneading under heat, etc., the shapable mass obtained consisting of cork particles held together by a polyvinyl alcohol binder mechanically plasticized by the insoluble substance or substances employed. Subsequently, this material may be processed into the products desired, as by moulding.

It is understood, however, that the invention is not restricted to products obtained in the above manner. In certain cases, for example, the insoluble substance or substances used as the mechanical plasticizer may be satisfactorily dispersed in the solvent for the polyvinyl alcohol without emulsification. Moreover, there are certain types of substances which may be used to provide mechanical plasticity without being preliminarily dispersed in the solvent for the polyvinyl alcohol, particularly such materials as rubbers and resins. In these cases, of course, a plastic mass of polyvinyl alcohol may first be produced in the ordinary way in the absence of the insoluble substance or substances used for producing prolonged plasticity, subsequent to which the latter may be introduced together with the cork particles by simple mastication. It is thus clear that the invention is not restricted to products obtained in any particular manner.

The size of the cork particles contained in the products of the invention may vary within wide limits. As an upper limit, for example, they may well exceed an overall dimension of ¼ inch. As a lower limit, they may be of the size of an air blown powder of 200-mesh and even finer. Of course, the choice of particle size will be largely dictated by the use to which the product of the invention is to be applied.

Certain specific embodiments of the invention will now be described by way of illustration, it being understood that they should not be construed as limiting the invention to the ingredients specified or to the stated amounts of these ingredients.

An emulsion was prepared consisting of the following ingredients:

	Grams
"Cardolite #627" light (a cashew nut oil polymer sold by the Irvington Varnish & Insulator Company)	120
"Circo-X" heavy mineral oil (a naphthenic base mineral oil sold by the Sun Oil Company)	30
Viscous oil #32 (a hydrocarbon polymer sold by the Standard Oil Company of California)	20
4% solution of polyvinyl alcohol	200
Formamide	150
Glycerine	250
Urea	20
Water	550

The polyvinyl alcohol solution was used at this stage merely to emulsify the three oils in the water, for which purpose a grade of polyvinyl alcohol of high viscosity and high saponification number was employed. The mechanical plasticizing means was obviously provided by these oils alone, the formamide, glycerine and urea being employed as plasticizing means of the usual soluble type. This emulsion was employed in the following mixtures:

Coarse grade of cork (about 4-mesh)

Cork ____ grams	50	50	50
Polyvinyl alcohol (powder) ____ do	50	25	17
Emulsion ____ do	75	37.5	25.5

Medium grade of cork (about 10-mesh)

Cork ____ grams	50	50	50
Polyvinyl alcohol (powder) ____ do	50	25	17
Emulsion ____ do	75	37.5	25.5

Fine grade of cork (air blown powder of about 200-mesh)

Cork ____ grams	75	75
Polyvinyl alcohol (powder) ____ do	75	37.5
Emulsion ____ do	112.5	56.25

In producing these mixtures, the cork particles were thoroughly admixed with the powdered polyvinyl alcohol prior to carrying out the admixture with the emulsion. As will be noted, there was no appreciable variation in the ratio of polyvinyl alcohol to emulsion in these various mixtures, but the proportion of cork varied considerably for each of the three grades employed, especially the coarse and the medium grades.

The foregoing mixtures were first reduced to plastic sheets by milling. Thereafter, the sheets were pressed in a chromium plated mold under 2000 lbs. gage pressure at a temperature of from 100° to 115° C., the pressed sheets being allowed to cool under pressure. The various products thus obtained were all useful flexible products.

Another emulsion was prepared of the following ingredients:

	Grams
"Vultex" (a neoprene latex containing 20% solids)	150
Stand oil (oxidized linseed oil)	21
Mineral oil	8
Turpentine	6
4% aqueous solution of polyvinyl alcohol	90
Glycerine	125

The water in this emulsion was provided in the latex and in the polyvinyl alcohol solution. Here, the latex, linseed oil, mineral oil and turpentine constituted the mechanical plasticizing means. As before, the polyvinyl alcohol solution was employed to emulsify these various substances in the water, the glycerine being employed alone as a soluble plasticizer. The following mixtures were subsequently produced:

	Grams
Coarse grade of cork	40
Polyvinyl alcohol (powder)	50
Emulsion	133
Medium grade of cork	40
Polyvinyl alcohol (powder)	50
Emulsion	133
Fine grade of cork	50
Polyvinyl alcohol (powder)	50
Emulsion	133

In the same manner as before, these mixtures were successfully processed into useful flexible products.

It is to be understood that the invention is not limited to the features herein specifically described by way of illustration but can be carried out in various other ways within the purview of the invention.

What is claimed is:

1. A flexible and resilient cork composition unaffected by oils and fluid fuels comprising cork particles and a binder for said particles, said binder comprising polyvinyl alcohol, a solvent for the polyvinyl alcohol, and a substantially non-volatile oil in dispersed state, said solvent being substantially incapable of dissolving said oil.

2. A flexible and resilient cork composition unaffected by oils and fluid fuels comprising cork particles and a binder for said particles, said binder comprising polyvinyl alcohol, a solvent for the polyvinyl alcohol, and a plurality of substantially non-volatile oils in dispersed state, said solvent being substantially incapable of dissolving said oils.

3. A flexible and resilient cork composition unaffected by oils and fluid fuels comprising cork particles and a binder for said particles, said binder comprising polyvinyl alcohol, a solvent for the polyvinyl alcohol, and a polymerized oil in dispersed state, said solvent being substantially incapable of dissolving said oil.

4. A flexible and resilient cork composition unaffected by oils and fluid fuels comprising cork particles and a binder for said particles, said binder comprising polyvinyl alcohol, a solvent for the polyvinyl alcohol, and a drying oil in dispersed state, said solvent being substantially incapable of dissolving said oil.

5. A flexible and resilient cork composition unaffected by oils and fluid fuels comprising cork particles and a binder for said particles, said binder comprising polyvinyl alcohol, a solvent for the polyvinyl alcohol, and an oxidized drying oil in dispersed state, said solvent being substantially incapable of dissolving said oil.

6. A flexible and resilient cork composition unaffected by oils and fluid fuels comprising cork particles and a binder for said particles, said binder comprising polyvinyl alcohol, a solvent for the polvyinyl alcohol, and linseed oil in dispersed state, said solvent being substantially incapable of dissolving said oil.

7. A flexible and resilient cork composition unaffected by oils and fluid fuels comprising cork particles and a binder for said particles, said binder comprising polyvinyl alcohol, a solvent for the polyvinyl alcohol, and a resin in dispersed state, said solvent being substantially incapable of dissolving said resin.

8. A flexible and resilient cork composition unaffected by oils and fluid fuels comprising cork particles and a binder for said particles, said binder comprising polyvinyl alcohol, a solvent for the polyvinyl alcohol, and rubber in dispersed state, said solvent being substantially incapable of dissolving said rubber.

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