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A. H. WARTH ET AL

2,383,096

CORK COMPOSITION AND PRODUCTS MADE THEREFROM

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Fig. 1.

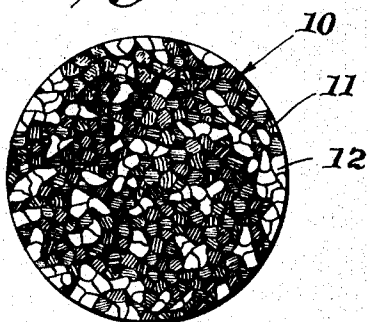


Fig. 2.

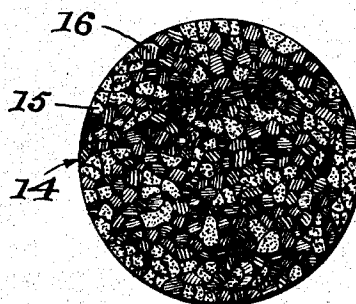


Fig. 3.

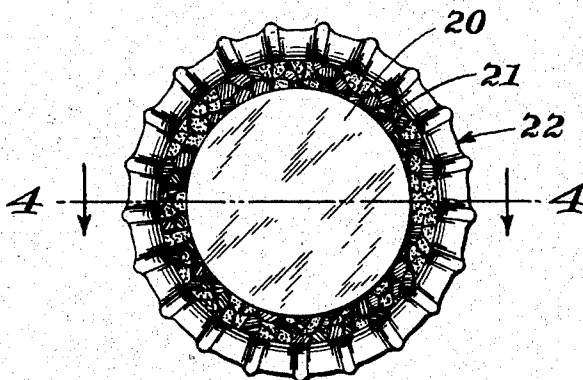
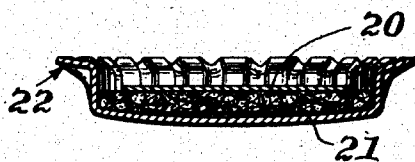


Fig. 4.



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UNITED STATES PATENT OFFICE

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CORK COMPOSITION AND PRODUCTS
MADE THEREFROM

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15 Claims. (Cl. 215—40)

The present invention relates to a new composition of matter, adapted for use as a gasket or sealing material of general utility. More particularly, the invention relates to a new composition of matter adapted to serve as a substitute for cork compositions of the type extensively used, for instance, in bottle caps of the crown type, as the sealing disc or cushion liner therein. In view of the scarcity at the present time of cork and rubber, it has become important to develop materials capable of serving as substitutes. Materials having the characteristics of cork, as to lightness, compressibility, resilience, and gas imperviousness, however, are extremely rare or non-existent, and, prior to the present invention, no completely satisfactory substitute for the standard cork composition discs for crown closures has been discovered.

The cell structure of natural cork is fundamentally different from practically all other woods or vegetable substances, since the cells have, theoretically, fourteen facets and have the characteristics of a spheroid, equally balanced in all directions. Hence, cork is substantially equally compressible in all directions, whereas practically all other woods are more compressible transversely of the grain than lengthwise. Because of these characteristics, cork may be, and conventionally is, granulated, mixed with a binder, treated by heat, and sliced into sheets or discs to serve as cushion liners for receptacle closures. In such discs, the relative positions of the granules are immaterial, since the granules have substantially equal compressibility and resiliency in all directions.

Practically all other vegetable materials, however, are grainy, stringy, or have a substantial fiber content, which make them less compressible in a lengthwise direction than transversely. Hence, when such materials are comminuted or granulated and mixed with a binder, some of the particles are so positioned as to be less compressible than others, with the result that the sealing pad has varying characteristics as to compressibility, resiliency, and sealing efficiency over different portions of its surface.

An exception to this general rule occurs in the case of the pith of the stem of the common hollyhock plant. Hollyhock is known in various sections of the country by different names, such as "*Hibiscus coccineus*, Walt." "*Hibiscus moscheutos*," frequently designated as "sea hollyhock," "*Althaea rosea*" which is of the cultivated type and "*Sidalcea malvaeflora*" known to California as the wild hollyhock; the foregoing are typical

of hollyhock, such as is referred to in the specification and claims. Although this pith does not have the gas imperviousness of natural cork, its cell structure resembles cork somewhat, and the material is compressible and somewhat elastic in all directions. The hollyhock pith is considerably softer than cork and, by itself, does not have sufficient strength, body, and imperviousness to serve, in granulated form, with a binder as a satisfactory cork composition substitute for receptacle closures and the like. It has been discovered, however, that this granulated material, when properly treated as described below, may serve as a filler or extender in cork compositions and may be employed to replace substantially 50% by volume of the cork granules, thus making it possible, in commercial practice, to make a given amount of cork go substantially twice as far as heretofore in providing sealing discs for receptacle closures.

An object of the invention, therefore, is to produce a cork composition having substantially all of the characteristics of standard compositions of the prior art, but employing a lesser amount of cork granules. To this end, the invention aims to conserve the supply of natural cork, by diminishing the amount employed in a given volume of the new composition.

A further object of the invention is to reduce the cost of cork compositions, by substituting for a portion of the natural cork normally employed, a cheaper material.

A further object of the invention is to produce a cork composition that cannot be distinguished by casual inspection from the standard cork compositions heretofore employed. To this end, the invention provides for dyeing the substitute material to match the cork, whereby the substitute material is substantially indistinguishable in the finished product from the natural cork.

A further object of the invention is to increase the impermeability of normally porous material mixed with granulated cork, so as to make the finished product substantially as impervious to gases as prior art compositions, or at least to make the finished product sufficiently impervious to gases as to satisfy commercial requirements.

A further object of the invention is to provide means for rendering relatively pervious cork composition cushion discs substantially impervious.

Other and further objects and advantages of the invention will be apparent to those skilled in the art, from a consideration of the following description of a specific embodiment of the invention.

In the drawing:

Figure 1 is a diagrammatic plan view of a cushion disc for a crown closure, made from the cork composition of the present invention, with the pith granules in their natural, non-dyed state;

Figure 2 is a similar diagrammatic view with the pith granules indicated as having been dyed to match the cork granules;

Figure 3 is a bottom plan view of a crown closure in accordance with the present invention, and

Figure 4 is a diametric section taken on line 4—4 of Figure 3.

In carrying out the invention of the present application, hollyhock stem raw material is gathered from areas where it grows in great abundance, such as in certain sections of Florida. This raw material has a long fibrous, gray bark of extreme thinness, similar to tissue paper. The stems are decorticated by stripping or peeling off the bark which only lightly adheres to the internal pith. The pith is then ground or granulated in a Ball & Jewel mill, in the same manner that cork is conventionally ground. If the moisture content of the stem material is at the optimum, between 5 and 6%, there is very little loss in grinding, whereas if the material is bone-dry, the loss is greater. Therefore, it is desirable to control the moisture content prior to the grinding operation, for instance, by wetting, if the moisture content is unduly low. Since the hollyhock stems contain none of the dirt, bark dust, and other impurities that are prevalent with cork, the grinding loss is less than with cork in ordinary milling operations.

The ground hollyhock material has a density much less than cork, i. e., about .1085, as compared with .25-.20 for cork. As stated above, it has a cellular structure, rather than being of fibrous nature and is substantially equally compressible in all directions. It is softer and more compressible than cork, but this disadvantage can be overcome by treating the granulated pith in suitable ways, such as by impregnating the particles with a thin glue solution containing a wetting agent. Penetration or impregnation of the particles causes their density to approach that of cork and decreases their compressibility.

In order to improve the appearance of the finished product, it is desirable to dye the granulated pith, since the material in the natural state is substantially white or light gray in color. Any dyes, such as those employed in the manufacture of artificial chocolate or certain extracts from coffee beans, may be employed. A certified color dye known as chocolate brown, of the National Aniline & Chemical Co. has been found to be entirely satisfactory for this purpose.

Preferably, the dye is incorporated in the thin glue solution used to impregnate the hollyhock particles. A suitable formula for this purpose is as follows:

	Parts
Water	50
Gelatin	20
Glycerine	35
Tan color	1
Aerosol	1

The gelatin and the glycerine are made into a dough-like mass with 35 parts of water and, after soaking for several hours, the mixture is melted at about 150° F., when the water soluble tan color and the aerosol (wetting agent) are added with 15 parts of water or sufficient to thin out the mixture. The wetting agent permits the mixed glue to

penetrate the hollyhock particles, carrying the tan dye along, imparting to the particles an appearance similar to cork.

After such treatment with the impregnating agent and the dye, the pith particles are air dried and then thoroughly mixed with the previously ground cork granules. The glue binder may then be added while the pith and cork particles are tumbling in a dough mixer. The resulting product may be packed into rods or blocks or roll molds and subjected to the usual heat treatment, to set the glue binder. After a suitable seasoning period, the cushion discs may be sliced from the rod or sheets cut from the roll or block in the usual manner. Of course, any other known method of making the liners or gaskets may be employed, substituting the mixture of treated pith particles, granulated cork particles, and glue for the usual granulated cork products alone.

A suitable formula for the binder, employed to secure the hollyhock pith particles and the cork particles together is as follows:

	Parts
Water	31
Gelatin	22
Sulphonated oil	15
Glycerine	30
Paraffin wax	2

After the glue melt is made, an insolubilizing agent may be added to the melt, preferably just before applying the binder to the hollyhock and cork granules. If paraform is used as the insolubilizing agent, it should be added in the proportion of about 0.5 part to 100 parts of glue, but if hexamethylenetetramine is used, about three times that amount should be added.

Approximately 1 part of binder is added to 2 parts of the prepared hollyhock and cork mixture in the dough mixer to produce the agglomerate for packing, although the amount can be varied, to satisfy particular conditions.

The following formula is suitable for ribbon or sheet blocks or rolls:

	Parts
Cork (granulated in roller mill)	50
Decorticated hollyhock stems (Ball & Jewel Mill granulated, thin glue processed)	33
Cold glue mix	31
Sulphonated castor oil	5
Insolubilizing agent (1 part hexamethylenetetramine, 2 parts water)	2 1/4

The invention is not limited to specific proportions of pith and cork granules. It has been found that, in general, a proportion of 50% pith and 50% cork by volume is quite satisfactory and produces an effective sealing pad, capable of withstanding a gas pressure of 70 pounds per square inch, without the use of a center spot liner or other gas impervious layers or coatings. When cork and pith granules are mixed in the proportion of 25 pounds of cork to 15 pounds of hollyhock pith, the volumes of the two materials will be substantially equal and satisfactory sealing pads can be produced.

In the accompanying drawing, a sealing pad is indicated generally at 10, the cork granules being shown at 11 and the hollyhock pith granules at 12. Although the invention is not limited to any particular relation of particle sizes, it is preferred that all of the granules be ground to substantially the same average size, such as those that will pass screens having eight openings and twelve openings to the inch. The pith granules 12 in Figure 1 are shown in their nat-

ural, non-dyed condition and appear in the finished product as substantially white or light gray spots. If this is objectionable, the particles may be dyed as indicated in Figure 2, so that the pith particles 15 substantially match the cork particles 16 in the disc 14.

As indicated in Figures 3 and 4, a center spot liner 20 may be adhesively united to the exposed face of the cushion disc 21, in concentric relation to the crown closure 22, as is well understood in the art. The spot liner may be of any of the well-known materials, such as aluminum foil, Vinylite, varnished paper, or the like. It has been found in practice that, when a center spot of this type is employed, the sealing pressure is raised from substantially 70 pounds per square inch, as mentioned above, to over 100 pounds.

The invention also contemplates applying to the exposed face of the cushion disc, a layer of a resin-wax composition, to increase the gas imperviousness of the disc as a whole by sealing the surface cells of the hollyhock pith granules.

The pith of other plants may be substituted for the hollyhock pith for certain purposes, although not as satisfactory for other purposes. The pith of sunflower stalk and similar plants has proved satisfactory in cases where equal compressibility of the particles in all directions is not essential.

It must be understood, therefore, that the invention contemplates all variations and changes coming within the scope of the appended claims and their equivalents.

We claim:

1. A cork composition comprising cork granules, pith granules from hollyhock of the Florida type known as *Hibiscus coccineus*, Walt. intermixed therewith, and a binder.

2. A cork composition comprising substantially 50% each by volume of granulated cork and granulated pith from hollyhock of the Florida type known as *Hibiscus coccineus*, Walt. and a binder.

3. A cork composition comprising granulated cork and granulated hollyhock pith material, and a binder.

4. A cork composition comprising substantially equal volumes of granulated cork and granulated hollyhock pith material.

5. A cushion disc adapted for use as a sealing pad in a receptacle closure or the like, comprising granulated cork, granulated hollyhock pith, and a binder.

6. A cushion disc adapted for use as a sealing pad in a receptacle closure comprising granulated

cork and granulated hollyhock pith in substantially equal volumes, and a binder.

7. A cushion disc adapted for use as a sealing pad in a receptacle closure comprising substantially equal volumes of granulated cork and granulated hollyhock stem pith, and a binder, the cork and pith granules being of substantially the same average size.

8. A cushion disc adapted for use as a sealing pad in a receptacle closure comprising granulated cork, granulated hollyhock pith impregnated with glue to decrease its porosity, and a binder.

9. A resilient, substantially gas-impervious sealing disc for use in a receptacle closure comprising granulated hollyhock pith, the particles of which are impregnated with a cell-sealing agent to decrease their porosity, granulated cork, and a binder.

10. A resilient, substantially gas-impervious sealing disc for a receptacle closure comprising particles of granulated hollyhock pith pre-coated with glue to decrease their porosity, granulated cork particles intermixed therewith, and a binder uniting the cork and pith granules.

11. A cork composition comprising granulated cork, granulated hollyhock pith dyed a color to match the cork granules, and a binder.

12. A cork composition comprising granulated cork, granulated hollyhock pith, the particles of which have been dyed to match the cork and have been pre-treated with glue to decrease their porosity, and a binder.

13. A cork composition comprising granulated cork and granulated hollyhock stem pith in substantially equal volumes, the pith granules being characterized by the presence of sufficient brown dye to substantially match the cork, by a cell-sealing agent which decreases their porosity, and by being of the same average size as the cork particles.

14. A receptacle closure having secured therein a cork composition cushion liner comprising granulated cork, granulated hollyhock pith, and a binder.

15. In combination, a cap of the crown type, a cushion liner therefor comprising substantially equal volumes of granulated cork and granulated hollyhock pith material, and a center spot of gas-impervious sheet material adhesively united to the exposed face of the liner.

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