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A. H. WARTH

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CAN END

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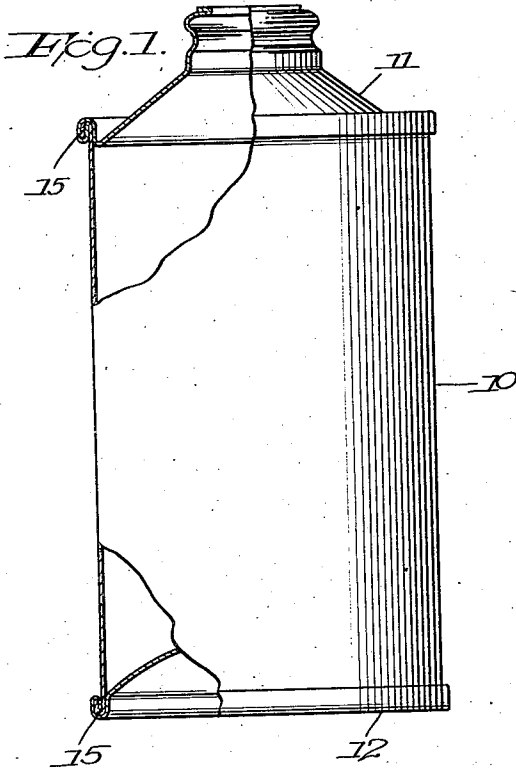
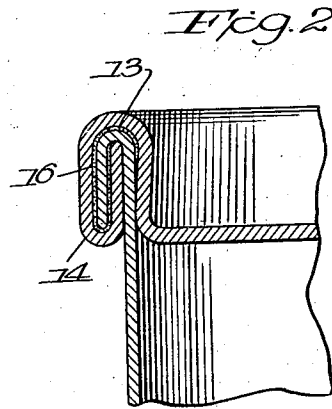


Fig. 3.

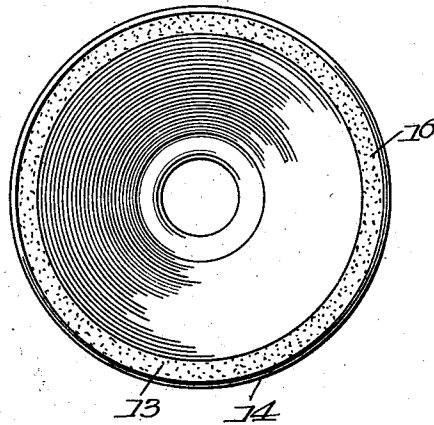
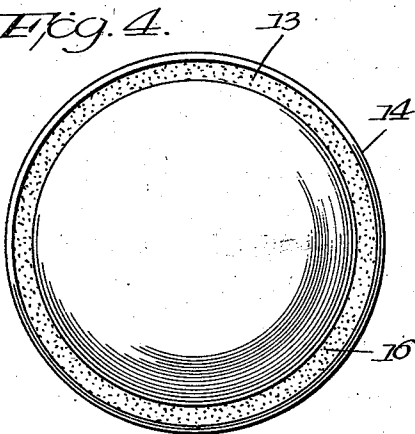


Fig. 4.



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CAN END

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The present invention relates to can ends, and particularly can ends of the type which are joined to the bottoms and/or tops of can bodies by folded or interlocked seams. Such can ends are customarily provided with a film of a somewhat plastic, flexible and resilient sealing material which is disposed in the groove of the end, and serves as a gasket to seal the joint formed by seaming the flanges of the container body and of the end.

A large number of sealing or gasket compositions are available, the most widely used being those which include rubber or latex. These various compositions have been satisfactory but possess definite limitations as, for example, they tend to char at high temperatures, such as are encountered in sterilizing the contents and in baking a decorative coating upon the metal container. In addition to having this general objection, rubber compositions also require the use of accelerators, retarders, anti-oxidants, and other reagents in order that the compound may have the proper life and resistance.

It is the principal object of the present invention to provide a can end sealing or gasket material, not only free of the above objections, but capable of being universally employed regardless of the contents and temperature conditions which will be encountered. That is to say, the base or principal member of the present composition to which, of course, may, if necessary, be added other constituents, is generally useful for all cases requiring a sealing compound or gasket. This is an important advantage over present practice which requires that compounds having markedly different characteristics for each special application, be maintained in stock by the manufacturer, thereby creating a serious item of expense.

To this end, the invention embodies a gasket material which, (1) does not require complicated control methods of manufacture and the inclusion of reagents such as are necessary with rubber compositions; (2) possesses all of the required resistant properties, as well as the desirable plastic, flexible and resilient characteristics of rubber compounds; (3) is substantially unaffected by sunlight and adverse atmospheric conditions, particularly to cold temperatures which makes it possible to place on the market the gasket material and can ends which may be stored for an indefinite period of time, and thus replace can ends which have expensive paper gaskets; (4) is not only universally applicable as a can end gasket, but is particularly resistant

to high and low temperatures, e. g., up to about 350° F. and even higher flash temperatures and down as low as -50° F. so that even under extreme conditions the sealing efficiency of the material at the seam is not affected; (5) has a long life when applied to the can end, and, hence, permits the gasket ends to be shipped and stored for an indefinite period; and (6) possesses strong adherence to metal and the property of forming a continuous film coating the entire wall surface of the groove in the can end, and retaining its initial area and shape, as distinguished from previous compounds which display a tendency to shrink and break, often seriously affecting the efficiency of the seal at the joint. Charring heretofore experienced at high temperatures with previous recommended sealing compounds is eliminated. Furthermore, the composition is simple in its make-up and it can be readily compounded into a few standard forms suitable for a wide variety of sealing conditions. Also, the viscosity of the composition is easily controlled to take care of a particular sealing problem and render the material applicable by existing automatic machinery.

I have discovered that a gasket compound having the above desirable qualities may be produced by using, as a base, a substantially saturated hydrocarbon resin resulting from the catalytic polymerization of a liquid olefin by catalysts having a halide with a trivalent atom. This base may be employed with a wax of suitable melting point, a resin either natural such as hydrogenated rosin or synthetic such as a vinyl resin or polyvinyl acetal resin, an inert filler such as clay, zinc oxide, bentonite, kieselguhr or infusorial earth and an adhesive such as glue, and latex may be added to the base if desired. The mixture may be dissolved in a solvent or dispersing water and the consistency of the composition is easily controlled for feeding the usual machines now employed. In some cases, the wax and/or the filler and/or the adhesive, and/or the resin, and/or the latex may be omitted.

The ingredients are so compounded when a water dispersion is used, as to form a composition preferably having a pH on the alkaline side which I have found contributes to the formation of a permanently stable and uniform sealing material possessing the above characteristics and high heat resistance.

In forming the composition of this invention, I prefer to use as a base, "Vistanex," which is polymerized isobutylene as made and sold under that name by the Standard Oil Development

Company, or its counterpart "Oppanol B," as prepared by I. G. Farben Industry. "Vistanex" is formed by the polymerization of isobutylene with aluminum chloride or boron trifluoride according to my best information, and the polymerization is carried out at a low temperature, for instance, from 0° F. to -100° F., or even lower. The "Vistanex" compositions are generally described as having a form varying from a very soft sticky, clear solid which flows slowly when cold to harder forms which appear much like pure white crepe rubber. I have found that when "Vistanex" is used as a base, it is desirable to use "Vistanex medium" which is a medium hard variety, and "Vistanex" #6 which is somewhat soft and sticky.

Numerous other unsaturated hydrocarbons may be similarly polymerized to make resins suitable for my purpose such as iso-hexene, cyclohexene, trimethyl ethylene, iso-amylene, and other mono-olefins. Branched chain, and particularly iso, mono-olefins are preferred. Such compounds are satisfactory for the base of my sealing composition, provided they have the desired plastic characteristics and possess the desired resiliency and plasticity in their harder forms when dried.

The wax employed will preferably be one which is free from odor or flavor-imparting characteristics, does not contain greases or oils which liquefy out under high temperatures and is chemically inert. The wax will be selected in accordance with the temperature to which the container and its contents will be subjected. Thus, a high melting point wax is preferably used where the container will be heated to temperatures, for instance, of 200 to 450° F., and a lower melting point wax such as paraffin is used where the container will be subjected to temperatures around 125° F. Various waxes may be used such as paraffin wax, "Mineral beeswax" (a hydrocarbon wax commercially available under this name), Ozokerite and ceresin.

More economical solvents may be used with low melting point waxes, and it will be noted that the composition may be very simply prepared as distinguished from the involved methods surrounding the manufacture of rubber compositions. The "Vistanex" is readily compatible with the wax, and with resin and latex, solvents being used where necessary, and, therefore, the composition is free from any complicated procedure as regards its preparation and is quite stable.

The clay or other inert filler should have an extremely small particle size, and should be alkaline in the case of water emulsions. A filler of this type makes the composition very stable and uniform and avoids the use of expensive colloid mills which are now generally used in the making of rubber sealing compositions including mineral constituents. Where the filler is not of a proper particle size, the aggregates, either before or after addition to the mixture, must be broken down as in a colloid mill to secure uniform solution or dispersion of the wax and/or the "Vistanex" in either a solvent or in water, as otherwise settling may occur.

Suitable solvents are those of the light gravity distillates of petroleum and of coal tar. In fact, any of the aromatic or aliphatic hydrocarbons may be used. The solvent employed is preferably of the order of toluene, many organic solvents being suitable. The solvent vehicle is preferably one which is readily evaporated after the com-

position has been applied to the can end. The evaporation of solvent may occur either by air drying or by a sufficiently raised temperature to drive off the solvent. Where, for example, the can end is subsequently subjected to temperatures of about 350° F., it is found that the volatilization from the solid material left after the drying step is insufficient to disturb the efficiency of the joint made between the can body and the end.

Where an adhesive substance is added to the aqueous composition, for example, as emulsifying agents and protective colloids to enhance stability, such materials as fish glue or hide glue or mixtures of these alone or with albumen and casein have been found very useful.

In the case where the composition is dispersed in water, other suitable emulsifying agents such as stearic acid with triethynolamine or morpholine are employed. Dispersing agents of this character which form soaps and induce emulsification are preferred, it being understood that there are many other similar and suitable emulsifying reagents. The important consideration is to secure a soap of the character produced by the use of stearic acid and triethynolamine which is a trifle alkaline when a water emulsion is used. This assists in balancing the pH of the composition so that it is slightly alkaline and tends to make the dispersion permanent and uniform, i. e., stable.

I find that my "Vistanex" composition, in addition to its high heat resistance, and freedom from chemical reagents, will form when dried, a plastic, flexible resilient and tough sealing film which is possessed of other required properties such as water resistance and insolubility for most purposes for which tin cans are used, and is devoid of odor and taste imparting characteristics. Moreover, the composition possesses the required chemical inertness and resistance and is compatible with and strongly adherent to metal surfaces to be sealed, such as tin plate or steel upon which it forms a film of required firmness. It does not break or chip when the metal is sharply bent or folded and does not tend to separate from the metal or shrink under temperature changes.

Example I

A satisfactory composition consists of "Vistanex medium," 8 parts; "Vistanex" #6, 2 parts; and paraffin (125° F. melting point) 2 parts. Instead of paraffin, one or more of the other waxes may be used in combination therewith or in lieu thereof. These materials are dispersed in toluene or other suitable solvent.

By adding a very small amount of emulsifying agent, for example, stearic acid with triethynolamine, it has been possible to disperse the "Vistanex" and wax in water. While the consistency of the solution or dispersion may be readily controlled without addition of inert filler, preferably the latter, in the form of a finely divided clay or fillers heretofore mentioned, is added to control consistency and enhance stability of the compound. The composition of proper consistency is fed through the usual can end applying machines.

Example II

"Vistanex medium" is dispersed in a solvent such as toluene in the amount of 25% by weight of "Vistanex" and 75% solvent. "Vistanex" #6 is dispersed in a similar solvent, in the amount

of 75% by weight of the "Vistanex" and 25% solvent. A suitable quantity of high or low melting point wax is melted and colloidal clay or other filler mentioned above is added to the melted wax. A pigment such as carbon black or ferric oxide may be mixed in the filler. The filler and the wax, while warm, are dispersed in an adequate amount of solvent, such as toluene or other solvents mentioned, and then combined by thoroughly mixing with the "Vistanex" solutions. More solvent is added, if necessary, to bring the mixture to a viscosity for applying to the can ends. For example, the solids content may be 17.5 percent more or less and the remainder solvent. The viscosity increases or decreases with the amount of solvent used, and will depend upon the best pressure required for the applying machine.

A suitable proportion of solids for a satisfactory compound prepared as above is:

	Per cent
"Vistanex Medium"-----	54.5
Petro-wax-----	13.5
Colloidal clay-----	17.6
Pigment-----	0.9

Further examples of satisfactory examples having a required solids content are as follows, the proportions of solids content being expressed for convenience:

Example III

	Parts
"Vistanex Medium"-----	38.76
"Vistanex" 6-----	9.52
Rosin hydrogenated-----	19.40
Mineral beeswax-----	9.52
ZnO-----	23.80

Example IV

	Parts
"Vistanex Medium"-----	42.0
"Vistanex" 6-----	10.00
Rosin hydrogenated-----	22.00
ZnO-----	26.00

Example V

	Parts
"Vistanex Medium"-----	32.00
"Vistanex" 6-----	8.00
Rosin hydrogenated-----	32.00
Mineral beeswax-----	8.00
ZnO-----	20.00

Example VI

	Parts
"Vistanex Medium"-----	36.5
"Vistanex" 6-----	9.50
Rosin hydrogenated-----	36.00
Clay-----	16.0
Fe ₂ O ₃ -----	2.0

Example VII

	Parts
"Vistanex Medium"-----	31.8
"Vistanex" 6-----	7.95
Rosin hydrogenated-----	31.8
Mineral beeswax-----	7.95
Clay-----	18.5
Carbon black-----	2.0

In each of the examples, the "Vistanex" is dissolved in suitable solvents such as toluene, benzene, "Benzo-sol" as sold by Shell Union Oil Corporation, and the viscosity of the mixture is controlled in accordance with the pressure of the applying machinery and the specific gravity of the solvent.

The several examples are dried at 60° C. for

fifteen minutes, 100° C. for ten minutes, and 120° C. for five minutes.

Where necessary, use is made of a colloidal mill or a suitable grinding machine.

Example VIII

In preparing a "Vistanex" can end gasket compound of the water emulsion type as referred to in Example I, but omitting wax, the "Vistanex" #6 and "Vistanex Medium" are handled separately. That is to say, the latter is dissolved in the proportion of 25% by weight with 75% of toluol or other solvent. The "Vistanex" #6 is dispersed in water with the aid of a very small amount of an emulsifying agent such as stearic acid with triethylonalmine, i. e., about one gram of the latter in two grams of melted stearic acid and seven grams of water.

Further examples of the water emulsion type of composition are given below and for convenience are expressed in proportions of solids, and on a dry basis; on a wet basis these compositions contain approximately 30 percent solids and the remainder water and solvents such as mentioned herein:

Example IX

	Parts
Emulsifying agent-----	1
"Vistanex Medium"-----	37
"Vistanex" 6-----	10
Hydrogenated rosin-----	29
Clay-----	23

Example X

	Parts
Emulsifying agent-----	1.3
"Vistanex Medium"-----	42
"Vistanex" 6-----	12
Hydrogenated rosin-----	33.7
Clay-----	11

Example XI

	Parts
Emulsifying agent-----	1.1
"Vistanex Medium"-----	35
"Vistanex" 6-----	12
Hydrogenated rosin-----	33.9
Clay-----	18

In the foregoing examples, it will be noted that zinc oxide is preferred with compositions of the solvent type while a colloidal clay is preferred in compositions of the aqueous emulsion type.

The presence of the hydrogenated rosin accomplishes a double function in that it adds to the adhesiveness and body of the final film and also increases its hardness and resistance to abrasion.

I have discovered that the pH of the compounds of the several examples is of considerable importance, in the water emulsion type, to produce a stable uniform dispersion or solution. Thus, with substantially the proportions described in connection with Example I, but using a water solution of "Vistanex" #6 with the solution of "Vistanex" medium as described in Example III, I have found that the emulsifying action of the soap, namely, a soap which is somewhat alkaline as formed, for example, by the stearic acid and triethylonalmine, in the above mentioned proportions, is at the optimum for obtaining a stable uniform dispersion. It appears best to have the solution slightly alkaline, and the constituents are added in an amount to so balance or buffer the pH as to give this result. That is to say, the addition of clay or inert filler increases alkalinity as does the "Vis-

tanex" which, in itself, is slightly alkaline. Therefore, I find that the various ingredients must be of the proper pH value so that the final can end sealing material does not break or lose its stability and is not sufficiently alkaline to be of a soapy or non-adhesive nature. The preferable maximum pH is 11 and a preferable minimum is 7 plus.

The amount of water added to the dispersion thus formed is regulated according to the type of clay and the resultant viscosity and film weight desired.

A colloidal mill is preferably employed for preparing the final compound if there are particle aggregates or clumps of the filler.

It is to be understood that "Vistanex" of proper viscosity or a compound of "Vistanex" such as a Vistanex-wax, Vistanex-filler, Vistanex-wax-filler, Vistanex-adhesive, Vistanex-wax-adhesive, Vistanex-filler-adhesive, and Vistanex-wax-filler-adhesive or Vistanex-resin and Vistanex-latex with or without other modifying agents may be employed. In each case, as will be appreciated, a stable, uniform, compound of required viscosity, as a solution or dispersion, may be prepared without involved processing or addition of complicating chemical reagents.

After the can end lining material has been applied in the groove of the can end, it is preferred to dry and harden the same to a final plastic, flexible and resilient state by circulating air at ordinary room temperature and then subjecting the same to a temperature of about 110° C. particularly if the water emulsion type is used. With lower boiling solvents, heating can be dispensed with.

It is to be understood that the compounds above described and their preparation may be variously modified. Therefore, I do not wish to be limited to the precise disclosure, since the invention embraces the use of equivalent compounds and constituents and processes of manufacture whereby the same results are attained.

Also, the can end shown in the accompanying drawing is simply representative, since the gasket material may be used with substantially all types of ends.

Referring to the drawing,

Figure 1 is a side elevation of the can partly broken away and illustrating the top and bottom ends of this invention seamed to the container body;

Figure 2 is an enlarged view showing in section, one of the seams of Figure 1;

Figure 3 is a plan view showing the interior of the top end of the container of Figure 1 with the composition of this invention applied in the groove of the end; and

Figure 4 is a similar view of the bottom end of the container body.

The invention is useful with various types of containers such as tin cans, of which the container shown in Figure 1 at 10 is illustrative. This container includes a cone top or end 11 and a bottom or end 12. Both the top 11 and the bottom 12 are provided with the usual groove 13 and flange 14 whereby the top and bottom may be seamed or folded with a similar flange 15 at the top and bottom of the body 10 to form respectively a joint illustrated in Figure 2. Within the bottom of the groove 13, the improved can sealing composition of this invention is applied. This is accomplished in the usual manner by extruding a thin film 16 of the composition into the groove by usual machinery and

then drying and hardening the same as above described. Thereafter, the can ends are stored or transferred to the assembly line and united with the can as required, in the usual seaming machines.

In applying a sealing compound to the groove of a can end, it is desirable to form a continuous film which extends beneath the flange 14 and upwardly over the inner surface of the same, so that there is a continuous film coating the groove and the entire inner surface of the flange.

An objection to compounds heretofore used has been their tendency after the film is applied to shrink or otherwise assume an irregular shape around the edge of the film which overlies the inner surface of the end flange. That is to say, although a film completely overlying the flange inner surface is initially applied, there is a marked tendency for materials heretofore used to break down or separate from the metal surface along and over the inner surface of the flange and beneath the flange. Whether this is due to insufficient surface tension, shrinkage during aging, or improper capillarity is not known.

The compound of the present invention overcomes the foregoing objections, and when once applied in a complete continuous film, retains substantially its initial area and shape and adheres to the metal throughout the area of the sealing groove and undersurface of the flange 14 without appreciable or objectionable shrinkage or diminution of initial film area.

In referring to the use of various adhesives appearing above as emulsifying agents, and particularly colloids, it is to be understood that in addition to having these advantageous functions, such adhesives may also be used in amount to add to the adhesiveness of the gasket material.

Referring to Figure 2, it will be noted that the sealing film 16 flows in a manner to fill the joint between the interlocked body and end flanges, and forms a permanent resistant seal. Rigorous tests of containers so formed with contents of a nature difficult to seal such as beer and which have to be sterilized or pasteurized have proven very successful and showed no failure.

I claim:

1. A can end having a peripheral groove and a sealing composition in said groove comprising a medium hard material which is a substantially saturated hydrocarbon resin resulting from the catalytic polymerization of a liquid olefin by catalysts having a halide with a trivalent atom and known as "Vistanex" in an amount effective to produce a resilient body of sealing material and a softer tacky material being a substantially saturated hydrocarbon resulting from the catalytic polymerization of a liquid olefin by catalysts having a halide with a trivalent atom and known as "Vistanex" in a lesser amount effective to insure strong adherence of a medium hard "Vistanex" body of sealing material to the can end, and a filler.

2. A can end having a peripheral groove and a sealing composition in said groove comprising a medium hard material which is a substantially saturated hydrocarbon resin resulting from the catalytic polymerization of a liquid olefin by catalysts having a halide with a trivalent atom and known as "Vistanex" in an amount effective to produce a resilient body of sealing material and a softer tacky material being a substantially saturated hydrocarbon resulting from the

catalytic polymerization of a liquid olefin by catalysts having a halide with a trivalent atom and known as "Vistanex" in a lesser amount effective to insure strong adherence of a medium hard "Vistanex" body of sealing material to the can end, a different resin, and a filler.

3. A can end having a peripheral groove and a sealing composition in said groove comprising a medium hard material which is a substantially saturated hydrocarbon resin resulting from the catalytic polymerization of a liquid olefin by catalysts having a halide with a trivalent atom and known as "Vistanex" in an amount effective to produce a resilient body of sealing material and a softer tacky material being a substantially saturated hydrocarbon resulting from the catalytic polymerization of a liquid olefin by catalysts having a halide with a trivalent atom and known as "Vistanex" in a lesser amount effective to insure strong adherence of a medium hard "Vistanex" body of sealing material to the can end, a different resin, and zinc oxide.

4. A can end having a peripheral groove and a sealing composition in said groove comprising a medium hard material which is a substantially saturated hydrocarbon resin resulting from the catalytic polymerization of a liquid olefin by catalysts having a halide with a trivalent atom and known as "Vistanex" in an amount effective to produce a resilient body of sealing material and a softer tacky material being a substantially saturated hydrocarbon resulting from the catalytic polymerization of a liquid olefin by catalysts having a halide with a trivalent atom and known as "Vistanex" in a lesser amount effective to insure strong adherence of a medium hard "Vistanex" body of sealing material to the can end, wax, and a filler.

5. A can end having a peripheral groove provided with a sealing material formed by applying thereon a dryable dispersion and depositing the sealing material from the dispersion by volatilizing the dispersing medium, said sealing material comprising a medium hard material being a substantially saturated hydrocarbon resin resulting from the catalytic polymerization of a liquid olefin by catalysts having a halide with a trivalent atom and known as "Vistanex" in an amount effective to form a resilient body of sealing material when dry and a lesser amount of a softer tacky material being a substantially saturated hydrocarbon resin resulting from the catalytic polymerization of a liquid olefin by catalysts having a halide with a trivalent atom and known as "Vistanex" effective to disperse the larger amount of medium hard "Vistanex" and cause it to adhere to the closure upon drying, and a filler.

6. A can end having a peripheral groove provided with a sealing material formed by apply-

ing thereon a dryable water dispersion and depositing the sealing material from the dispersion by volatilizing the dispersing medium, said sealing material comprising a medium hard material being a substantially saturated hydrocarbon resin resulting from the catalytic polymerization of a liquid olefin by catalysts having a halide with a trivalent atom and known as "Vistanex" in an amount effective to form a resilient body of sealing material when dry and a lesser amount of a softer tacky material being a substantially saturated hydrocarbon resin resulting from the catalytic polymerization of a liquid olefin by catalysts having a halide with a trivalent atom and known as "Vistanex" effective to disperse the larger amount of medium hard "Vistanex" and cause it to adhere to the closure upon drying, and a filler.

7. The method of providing a closure with an adherent sealing material which comprises forming a dryable dispersion comprising a mixture of medium hard material being a substantially saturated hydrocarbon resin resulting from the catalytic polymerization of a liquid olefin by catalysts having a halide with a trivalent atom and known as "Vistanex" in an amount effective to form a resilient body of sealing material when dried and a lesser amount of softer tacky material being a substantially saturated hydrocarbon resin resulting from the catalytic polymerization of a liquid olefin by catalysts having a halide with a trivalent atom and known as "Vistanex" effective to disperse the larger amount of medium hard "Vistanex" and cause it to adhere to the closure upon drying, and a filler, applying the dispersion to the closure and depositing the "Vistanex" compounds from the dispersion by drying the dispersing medium.

8. The method of providing a closure with an adherent sealing material which comprises forming a dryable aqueous dispersion comprising a mixture of medium hard material being a substantially saturated hydrocarbon resin resulting from the catalytic polymerization of a liquid olefin by catalysts having a halide with a trivalent atom and known as "Vistanex" in an amount effective to form a resilient body of sealing material when dried and a lesser amount of softer tacky material being a substantially saturated hydrocarbon resin resulting from the catalytic polymerization of a liquid olefin by catalysts having a halide with a trivalent atom and known as "Vistanex" effective to disperse the larger amount of medium hard "Vistanex" and cause it to adhere to the closure upon drying, and a filler, applying the dispersion to the closure and depositing the "Vistanex" compounds from the dispersion by drying the dispersing medium.

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