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THIOUREA IMPREGNATED SEALING  
COMPOUND

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The following specification relates to our invention in improvements in corrosion inhibiting compositions as applied to metal containers for food products and other compounds which are apt to corrode the metal lining of the container.

Food containers such as tin plated metal cans are generally satisfactory with many food compounds and the like which by their nature do not attack the tin plate lining of the cans. However, there is a considerable number of products having slightly acid character which have a tendency to attack the tin plate and corrode the foundation metal. This is particularly true at the seams which have been made in the process of forming or closing the container, and where the inner tin plate has been impaired by bending or abrasion.

The provision in such a container of a source of corroding inhibiting composition has been suggested. For example, the prior patent of Stevenson and Flugge granted August 1, 1939, No. 2,168,107, discloses a sheet metal container in which a plastic sealing compound within the seams contains an inhibiting substance. However, no special provision has been made to regulate the discharge or insure the maximum availability of the inhibitor during storage.

It is a principal object of our invention to provide a sealing composition of such a container with a suitable inhibitor having a maximum availability and thus permitting a reduction in actual quantity of the inhibitor present.

It is a further object of our invention to increase the availability of the inhibitor to more than what is localized in the surface of the sealing compound. In this way the capsuling effect of the plastic composition is overcome, and more of the inhibiting composition rendered available.

A still further object of the invention is to insure a gradual leaching effect or discharge. Thus the inhibitor is supplied over a period of several weeks after the can is filled and sealed and hence any corrosive activity becoming evident in the product during storage will be immediately met and counteracted and the corrosion of the tin plate inhibited.

We have set out in the following description the preferred mode of attaining the above objects and others which will be readily apparent.

It is usual to provide a sealing composition, essentially a rubber-like material compounded with a resin, zinc oxide, anti-oxidants, carbon black and other commonly used ingredients. Such a sealing compound is applied to the groove and curl of the can end so that it will form an effective hermetic seal after being closed.

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As pointed out in the above mentioned patent, such a sealing composition may be the medium by which an inhibiting compound is supplied. Where this compound is added to the sealing composition direct, much of the compound is contained uniformly distributed in the body of the sealing composition and not readily available at the surface. This may be called a capsuling effect and as a consequence only a minor proportion of the inhibiting compound is available to be taken up by the contents of the can during packing and storage.

To increase the availability of the inhibitor, it is our purpose to uniformly disperse in the sealing composition a fibrous absorbent which is impregnated with the inhibiting compound. As the fibers extend inwardly from the surface of the layer of sealing compound, they have a wicking effect so that the liquids contained in the can will dissolve and release the inhibiting compound with which the absorbent fibers may be impregnated.

Finally, it is found that the addition of a dissolved resin to the fibers permits its more effective dispersion in the dough.

A suitable inhibiting compound may be prepared by dissolving thiourea in acetone and water. This may then be taken up by saturating cellulose flock with the solution. It is desirable to use flock in which the alpha cellulose is equal to 92% or better. The ratios used are as follows:

## Range of parts by weight

|                                                                  |          |
|------------------------------------------------------------------|----------|
| Fibrous absorbent (cellulose flock, 92 per cent alpha), 63.0 lb. | 30 to 75 |
| Thiourea, 12.0 lb.                                               | 10 to 20 |
| Acetone, 32.0 lb.                                                | 25 to 50 |
| Water, 14.0 lb.                                                  | 10 to 20 |

To the saturated flock there is then added synthetic resin dissolved in a suitable petroleum solvent. The mixture should then be stirred briefly. For this resin solution we use the following materials:

## Range of parts by weight

|                                    |            |
|------------------------------------|------------|
| Resin (Piccolyte S-115), 12.0 lb.  | 8 to 20    |
| Solvent (Skellysolve B), 190.0 lb. | 150 to 225 |

The above mixture is then combined with a milled mixture of rubber-like material preferably compounded as follows:

## Ratio to rubber

|                                      |          |
|--------------------------------------|----------|
| Rubber (GR-S), 30.0 lb.              |          |
| Resin (Piccolyte S-115), 4.0 lb.     | 1 to 8   |
| Zinc oxide, 54.0 lb.                 | 2 to 1   |
| Antioxidant (Agerite White), 0.6 lb. | 1 to 4%  |
| Carbon black, 0.15 lb.               | 0 to 0.5 |

The milled rubber is added to the impregnated fiber and resin solution which is then stirred until the dispersion is uniform. This may take from 20 to 30 hours at room temperature. The resulting compound may be strained through suitable filter equipment and stored in air-tight drums until used without suffering loss of properties.

There will be a total of 42 to 44% by weight of solids in the above composition.

After application to the container surface and drying, the dried sealing compound will have the following approximate percentage composition:

|                             |       |
|-----------------------------|-------|
| GR-S rubber                 | 17.1  |
| Resin, (Piccolyte S-115)    | 9.1   |
| Zinc oxide                  | 30.8  |
| Antioxidant (Agerite White) | .3    |
| Carbon black                | .1    |
| Cellulose flock             | 35.8  |
| Thiourea                    | 6.8   |
|                             | 100.0 |

As suggested above, this compound may be spread thinly upon the groove and curl of the container end and also upon the side seam of the container. After the end is seamed to the container, the compound forms a hermetic seal.

The watery contents of the can in contact with the sealing compound will gradually dissolve the inhibiting compound and leach it out. It has been observed that perhaps 20% of the inhibitor is thus leached out in the first two weeks of storage.

Under such circumstances the inhibitor protects the metal from attack by acid contents of the container. Typical acid contents may be apple-sauce, apple juice, strawberries, sour cherries or other acid fruits.

The sealing compound containing the saturated fiber has a slightly roughened hispidulous surface due to the fact that the fiber projects slightly from the surface. This is, of course, not sufficient to interfere with the sealing effect. However, it promotes the availability of the inhibiting compound present.

The formula for the inhibitor impregnated absorbent may vary within a wide range. While we have suggested the use of alpha cellulose flock of 200 mesh, other absorbent fibrous materials may be substituted such as finely ground wood fiber and the like.

As pointed out in the above identified patent, thiourea is one of several inhibitors found suitable for this purpose, and any of these and analogous compounds may be used in the present instance.

As a solvent for the inhibitor we may substitute other aliphatic alcohols such as methanol and isopropyl alcohol.

In compounding the synthetic resin we have used Piccolyte S-115 which is a pure hydrocarbon terpene resin having a melting point of 239° F. However, it may be replaced by ester gum which is a glyceryl ester of rosin, melting point 200° F. and acid number 6 to 8. This will also suggest other analogous resins suitable for this purpose.

Agerite white is the trade name for aldol-alpha-naphthyl-amine (Condensed Chemical Dictionary, 1942).

The Skellysolve B is a petroleum solvent having a boiling range of 145° to 160° F.

For this there may be substituted higher boiling solvents such as solvent naphtha B boiling from 160 to 240° F.

In place of the GR-S rubber we may also use natural rubber, butyl rubber and the like commonly known substitutes.

In place of zinc oxide we may use alumina and for antioxidant any suitable one such as Flectol H (condensation product of acetone-aniline) is suitable.

The addition of the inhibiting substance to the sealing dough by means of an absorbent fiber forms a very convenient means of ensuring an adequate supply for discharge into the can contents. The inhibitor is leached out gradually as needed. The leaching continues until the major part of the available inhibitor is thus rendered available to the contents of the can. As a consequence the use of a sealing composition containing two parts of thiourea per one million parts of the volume of the can is found to be as effective as six parts per million when the thiourea is compounded with the sealing dough without fiber. Expressed in another way, more of the thiourea is actually made available for use and hence less has to be incorporated in the sealing compound.

As indicated above, the corrosion inhibiting composition may be compounded of a considerable number of different ingredients and still come within the scope of the invention as defined in the following claims:

What we claim is:

1. A can sealing composition for inhibiting corrosion comprising a rubbery hydrocarbon plastic sealing compound insoluble in water containing sufficient fibrous porous cellulosic absorbent uniformly distributed therein to be partially exposed at its surface when spread, said absorbent being impregnated with thiourea.

2. A can sealing composition for inhibiting corrosion comprising a rubbery hydrocarbon plastic sealing compound insoluble in water containing sufficient fibrous porous cellulosic absorbent uniformly distributed therein to form an hispidulous surface when spread, said absorbent being impregnated with thiourea.

3. A can sealing composition for inhibiting corrosion comprising a rubbery hydrocarbon plastic sealing compound insoluble in water containing sufficient cellulosic flock uniformly distributed therein to be partially exposed at its surface when spread, said flock being impregnated with thiourea.

4. A can sealing composition for inhibiting corrosion comprising a rubbery hydrocarbon plastic sealing compound insoluble in water containing sufficient cellulosic flock uniformly distributed therein to be partially exposed at its surface when spread, said flock being impregnated with thiourea in approximately seven per cent of the total weight.

5. A can sealing composition for inhibiting corrosion containing a rubbery hydrocarbon plastic sealing compound insoluble in water, a compatible resin insoluble in water, zinc oxide and sufficient thiourea-impregnated cellulosic flock to appear partially exposed on the surface of the composition when thinly spread.

6. A can sealing composition for inhibiting corrosion containing a rubbery hydrocarbon plastic sealing compound insoluble in water, a compatible resin insoluble in water, zinc oxide, acetone, water, and sufficient thiourea-impregnated cellulosic flock to appear partially exposed on the surface of the composition when thinly spread.

7. A can sealing composition for inhibiting cor-

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rosion containing approximately 17 parts by weight of a rubbery hydrocarbon plastic sealing compound insoluble in water; 9 parts of a compatible resin insoluble in water; 31 parts of zinc oxide, 36 parts of cellulosic flock impregnated with 7 parts of thiourea, and fractional parts each of antioxidant and carbon black.

8. A spreadable can sealing composition for inhibiting corrosion containing approximately 17 parts by weight of a rubbery hydrocarbon plastic substance, 9 parts of a compatible resin insoluble in water, 31 parts of zinc oxide, 36 parts of a fibrous absorbent impregnated with 7 parts of thiourea, and at least 100 parts by weight of a volatile hydrocarbon solvent.

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