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METHOD OF PROTECTING TIN-PACKINGS AGAINST CORROSION AND MAKING THEM GLOSSY

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No Drawing. Continuation of abandoned application Ser. No. 872,748, Oct. 30, 1969. This application June 30, 1972, Ser. No. 267,983
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Int. Cl. C23f 11/02, 11/16, 11/18
U.S. Cl. 21—2.7 A 8 Claims

ABSTRACT OF THE DISCLOSURE

Tin-packings, i.e. tin-cans for food are protected against corrosion and made glossy at the same time by a method in which a tin-packing is treated with a mixture of inorganic and organic corrosion inhibitors having a common anion and having a synergistic effect together with washing and brightening agents.

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of Ser. No. 872,748 filed Oct. 30, 1969, and now abandoned.

BACKGROUND OF THE INVENTION

Field of the Invention

The invention relates to protecting tin packings against corrosion and rendering them glossy.

Prior Art

The known method of protecting tin packings against corrosion consists mainly in coating the packings, after sterilization or pasteurization thereof, with temporary protective agents in the form of an emulsion, a grease layer or a paraffin layer.

A disadvantage of these methods is the fact that they provide insufficient protection against corrosion since, in spite of the presence of the layer of inhibiting agent, the corrosion process which is initiated during sterilization or pasteurization continues while the tin-packing is stored.

In the literature Applicant has found no method for protecting against corrosion and imparting a gloss to tin-plate packings which involve the introduction of a mixture of inhibitors into the water used during the sterilization and pasteurization processes. On the other hand, there are a number of patents disclosing the use of inorganic and organic inhibitor mixtures with various additives causing a synergistic effect for many industrial appilcations. These mixtures, mainly empirically arrived at, are not based on the theoretical considerations involved in the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The object of the present invention is the provision of a method of protecting tin-packings, particularly for tinned foods, against corrosion and for making them glossy.

The method according to the present invention is based on the fact that a mixture of inorganic and organic corrosion inhibitors having a common anion produces a synergistic effect in preventing corrosion and with the cooperation of washing and brightening agents, the mixture causes a strong anodic polarization in the steel-tin coating cell. The mixture of inhibitors forms a stable complex which, by being adsorbed on the surface of the metal, decreases the binding force of the metal with the passivating oxygen, maintains the potential of the packing below the critical value at which pit formation occurs and deepens the passivating properties of the solution. The processes

occurring in the cell cause an anodic dissolution of steel and its immediate passivation. Under such conditions, the surface of the packing undergoes electropolishing and glossing. The electrochemical process of precipitation in the pores of the coating and the process of coagulation of some colloids proceed simultaneously, thus sealing the tin coating on the steel.

The purpose of the present invention is to protect tinplate packings against corrosion and to make them glossy during the sterilization or pasteurization process.

This purpose has been achieved by using a mixture of chemical compounds of a strictly determined qualitative and quantitative composition in which the process of protecting against corrosion and that of imparting a gloss to the packing proceed jointly with the sterilization or pasteurization process.

According to the chemical composition of the water and its hardness, as well as to the kind of sheet metal used for the packings, an inhibitor mixture, consisting of an inorganic inhibitor, an organic inhibitor having a common anion, a washing agent and a brightener, is dissolved in water and added with continuous stirring to water contained in a pasteurization tank or autoclave which is filled with packings for sterilization. In steam autoclaves, the mixture is placed in the form of a paste in a perforated container in the autoclave at the steam inlet. In horizontal autoclave, the bottom of the autoclave may be strewn with the mixture or the mixture may be placed in a perforated container near the steam or water inlet.

Among the inorganic inhibitors there are included disodium phosphate, sodium hexametaphosphate, water glass, sodium nitrite, and borax. Among the organic inhibitors having a common anion and which together with the other additives produce a synergistic effect, there are, for example, the phosphates: triethanolamine phosphate, hexamethylenetetramine phosphate, p-nonylphenol phosphate, styrophene phosphite; the silicates: 4-phenoxysilane, 4 - butoxysilane, calcium, silanolate, aminoalkylpolysiloxane; the nitrites: guanidine nitrite, diisobutylamine nitrite, piperidine nitrite, dicyclohexylamine nitrite; the borates: hydrated cyclohexylamine borate, triethanolamine borate, boric acid triphenyl ester. As the washing agents, there are used water glass, sodium dodecylbenzenesulphonate, ethoxylized anhydrosorbite oleate, ethoxylized pentaerythrite monooleate, ethoxylized p-nonylphenol; and as the brightener there is used sodium perborate.

The amount of the inhibitor mixture is determined in relation to the amount of water used for pasteurization or sterilization of the tin-packings. It is also dependent on the chemical composition and hardness of the water, as well as on the kind of sheet metal used. The amount is usually 0.05%–0.6% by weight; the percent share of the individual components of the mixture is as follows:

	Percent
Inorganic inhibitors	40–60
Organic inhibitors having a common anion	15–45
Washing agents	10–20
Brightener	5–20

The solutions based on phosphate inhibitors have a pH of about 9, nitrite solutions always are above pH 6.5, silicate solutions are up to pH 7, and borate solutions about pH 7. The modulus of the water glass used should be about 2–4.

After the pasteurization or sterilization process, the dried or wiped packing is passed, without any necessity of using an additional preservative, to storage, where the packings are isolated from one another by means of plates which are saturated with a mixture of inhibitors of which one may be a volatile corrosion inhibitor.

The method according to the present invention is more fully explained in the following Examples.

Example I

To 1000 liters of technological water of 0° of German hardness, which are used for the sterilization of 1000 0.5 kg. cans made of electrolytic tin-plate, there are added with constant stirring, a solution consisting of the following previously dissolved in water:

250 g. of disodium phosphate
100 g. of triethanolamine phosphate
100 g. of sodium dodecylbenzenesulphonate
100 g. of sodium perborate
250 g. of water glass.

The above is a homogeneous inhibitor solution having a pH value of about 9, and the sterilization is carried out therein. The cans, after being dried or wiped free of the superficial water layer, are directed, without any additional preservation, to storage where they are separated from one another by means of plates saturated on both sides with sorbate monooleate. The thus secured packings do not corrode at all during a two year period of storage.

Example II

To 500 liters of technological water of 2° of German hardness used for the pasteurization of 500 1 kg. packings made of hot tin-plate, the following is added with continuous stirring, after being previously dissolved in water:

200 g. of sodium nitrite
90 g. of diisobutylamine nitrite
75 g. of ethoxylized pentaerythrite monooleate
75 g. of sodium perborate
250 g. of water glass.

The above is a homogeneous inhibitor solution having a pH value of about 8.5 and pasteurization is carried out therein. The dried packings are separated from each other by means of plates saturated on both sides with ethoxylized pentaerythrite monooleate. Thus secured packings do not corrode within up to two years of storage.

Example III

In a steam pressure autoclave, at the steam inlet, there is suspended a perforated container containing an inhibitor mixture of paste consistency and composed of:

250 g. of water glass
250 g. of sorbate monooleate
150 g. of sodium perborate
250 g. of disodium phosphate
50 g. of hexamethylenetetramine phosphate.

The steam jet breaking against the container becomes saturated with the inhibitors. After the sterilization process the dried cans are directed, without any additional preservation, to storage where the cans are separated from each other by means of plates saturated on both sides with a 1:1 mixture in paraffin oil of sorbate monooleate and pentaerythrite oleate. Thus secured packings do not corrode even after two years.

Example IV

To 500 liters of technological water of 10° of German hardness, used for the pasteurization of 500 1 kg. packings made of electrolytic tin-plate there are added with continuous stirring, previously dissolved in water:

250 ml. of water glass of a modulus of 2–4
100 g. of 4-butoxysilane
70 g. of ethoxylized anhydrosorbite oleate
70 g. of sodium perborate.

The above is a homogeneous inhibitor solution having a pH value of about 7 and the pasteurization is carried out therein. The cans, after being dried or wiped free of superficial water are directed, without any additional preservation, to a storage area where they are separated from each other by means of plates saturated on both sides with a mixture of sorbate monooleate and pentaerythrite monooleate with an addition of dicyclohexylamine nitrite. These packings do not corrode even after two years of storage.

Example V

To 500 liters of technological water of 14° of German hardness, used for the sterilization of 500 0.5 kg. packings made of hot tin-plate, there is added with continuous stirring to an autoclave, a water solution of:

200 g. of borax
100 g. of triethanolamine borate
75 g. of ethoxylized pentaerythrite monooleate
75 g. of sodium perborate.

The above is a homogeneous inhibitor solution having a pH value of about 7.5 and sterilization in a pressure autoclave is carried out using said solution. The cans, after being dried or wiped free of the superficial water layer are directed, without any additional preservation, to storage, where they are separated from each other by means of plates saturated on both sides with paraffin oil, to which 50% of pentaerythrite monooleate has been added. The thus treated packings do not corrode, even after two years of storing.

Example VI

In a horizontal autoclave, the bottom of the autoclave is strewn with a mixture consisting of the following inhibitors:

300 g. of water glass
250 g. of disodium phosphate
100 g. of p-nonylphenol phosphate
75 g. of ethoxylized pentaerythrite monooleate
100 g. of sodium perborate

Then there are placed into the autoclave 3 baskets filled with 2000 0.25 kg. packings. The packings are covered with about 1000 liters of water and sterilization is carried out according to the conventional technological requirements.

After the sterilization process the cans, dried or wiped free of the superficial water, are directed to storage. If 2 autoclaves are operating in parallel, the inhibitors are to be introduced during 3 sterilization operations and the fourth operation is carried out without inhibitors.

The invention finds application in various fields of the food industry producing tinned preserves. The serviceable and technical advantages resulting from the use of the present invention consist in the elimination of corrosion of packings during the production and storage, improvement of the external appearance, preventing corrosion of the autoclaves, vehicles and equipment used in the sterilization or pasteurization process. Furthermore, the packings need no grease or emulsion coating, thus creating better labeling conditions and improving the external appearance of the packings, since the labels have no fat drippings. Also, the costs of cleaning the packings are decreased.

What is claimed is:

1. A method for preventing corrosion and imparting glossiness to tin-packings during the sterilization or pasteurization thereof with water, said method comprising adding to the water used in said sterilization or pasteurization, a mixture comprising (a) at least one member of the group consisting of disodium phosphate and sodium hexametaphosphate; (b) an organic derivative of said at least one member having an anion in common with said at least one member; (c) a washing agent and (d) a brightening agent, the organic derivative being at least one member selected from the group consisting of triethanolamine phosphate, hexamethylenetetramine phosphate, and p-nonylphenol phosphate.

2. A method according to claim **1**, wherein the washing agent is at least one member selected from the group consisting of water glass, sodium dodecylbenzene sulphonate,

ethoxylized anhydrosorbite oleate, ethoxylized pentaerythrite monooleate and ethoxylized p-nonylphenol.

3. A method according to claim 1, wherein the brightening agent is sodium perborate.

4. A method according to claim 1, wherein the mixture is used in an amount of 0.05–0.6% based on the weight of water used in the sterilization or pasteurization and the mixture is constituted by 40–60% of said at least one member, 15–45% of said organic derivative, 10–20% of said washing agent and 5–20% of the brightening agent.

5. A method according to claim 1, wherein the sterilization or pasteurization is effected in a steam autoclave and the mixture is placed in a perforated container near the steam inlet.

6. A method according to claim 1, wherein the sterilization or pasteurization is effected in a horizontal water autoclave and the mixture is placed in a perforated container near the water inlet.

7. A method according to claim 1, wherein after the sterilization or pasteurization, the tin-packings are dried and separated from one another by plates saturated with corrosion inhibitors.

8. A method according to claim 2, wherein said corrosion inhibitors saturating the plates include at least one volatile inhibitor.

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CERTIFICATE OF CORRECTION

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Inventor(s) Romuald Juchniewicz

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the heading to the printed specification, lines 10 and 11, "Oct. 10, 1968, 129,973/68" should read -- Oct. 30, 1968 129873/68 --.

Signed and sealed this 4th day of February 1975.

(SEAL)
Attest:

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Commissioner of Patents

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