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TIN POT OIL COMPOSITION

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This invention relates to the hot-dip coating of steel with tin, and more particularly to a composition of tinning oil for use in these operations.

In conventional hot-dip tinning practices ferrous sheets are passed through a bath of molten coating metal and withdrawn through an oil bath. The latter, termed tin-pot or tinning oil, acts to even the coating and to produce a clean bright appearing product. Satisfactory oil for this purpose must possess some flux-like properties; must have a high flash point and a high fire point for safety reasons; a low viscosity to minimize oil drag-out; and must be unusually stable at high temperatures. Further the oil must maintain these properties for appreciable periods of time. Palm oil possesses the required combination of properties, and is in general use in these coating operations. While it is an excellent material, it is costly and on occasion available only in limited supply. Consequently many attempts have been made to develop a substitute. Of these the most attractive from a cost angle have been concerned with compounding a cheap mineral oil with a small percentage of the palm oil or similar fatty oil or in some instances with a small amount of a fatty acid. Such mixtures, however, have been unsuccessful. The diluted oil lacked the activity of palm oil as respects smoothing and brightening and rapidly lost even its limited effectiveness as a tinning oil when operated under commercial conditions.

Accordingly it is an object of the present invention to provide a tin-pot oil composition which is cheaper than palm oil but possesses all of the desirable operating features of the latter material.

I have discovered that the limitations of the aforementioned cheap mineral oil mixtures are overcome by incorporating therein a very small amount of certain chloride salts and that when this is done, not only is the activity of the mixture as a tinning oil the equivalent of straight palm oil but the mixture possesses a longer active life than straight palm oil.

Materials which I have found to possess this activating effect are stannous chloride, ferrous chloride, aluminum chloride, ammonium chloride, zinc chloride and triethanolamine hydrochloride. Of these materials I prefer to use stannous chloride. My experimental results indicate that this is the true activating agent since only those chlorides which will react with iron and tin to form stannous chloride under the conditions obtaining in the coating operation are operative.

The minimum amount of agent which must be added to activate a mineral oil mixture is slightly more than 0.25% by weight. It is preferable however to use between 0.75 and 2.0%. Increasing the amount over 2.0% shows no additional benefit, although it does not appear to have a detrimental effect.

The activating agent may be incorporated into the oil mixture or may be added after the oil mixture is introduced into the coating pot. The latter procedure is preferable since there is a tendency for the chloride activator

to segregate when the mixture is allowed to stand. This segregation does not occur during operations of the coating pot due to convection currents in the hot oil bath and the stirring action caused by the movement of the sheets therethrough.

As previously mentioned the mixtures of mineral oil and palm oil or the like in which my activating agents are used are well known. Such mixtures can be prepared using any suitable mineral oil as a base to which is added about 10% by weight of a fatty oil containing as a natural constituent a free fatty acid of the group consisting of palmitic, stearic, oleic and linoleic acids. Examples of such oils are palm oil, castor oil, tallow and hydrogenated cotton-seed, coconut, corn or fish oil. Any of the above mentioned acids or mixtures of the same can be added as such. However, this adds to the cost of the mixture without adding to the efficiency thereof as a tinning oil. I prefer therefore to add a fatty oil and of these prefer the use of palm oil.

More than 10% of fatty oil can of course be used, however the cost of the mixture increases in proportion to the amount of this ingredient. Less than 10% can also be used, but the operating life of the mixture is shortened and it becomes increasingly difficult to maintain a proper operating mixture on the coating pot. From an operating view point the minimum amount of the fatty oil constituent is about 5%.

Regarding the mineral oil constituent, since this forms the major portion of the mixture it should be an oil which is reasonably stable at the temperatures of the coating operation, 500–600° F., and for safety reasons should have a flash point greater than 500° F. Suitable oils can readily be obtained from any refinery upon specification of the intended use. Examples of oils which have been used for this purpose are: Cylesso #300, Gulf #414 Oil, and Gulf #453 Oil. These materials are cylinder oils, typical physical properties of which are:

Gravity, ° A. P. I	24.0–25.0
Viscosity, S. U. V. at—	
100° F	2500–4000
210° F	150–225
Flash, O. C., ° F	550–590
Fire, O. C., ° F	625–690
Pour, ° F	+10–+25
Carbon residue, per cent	1.0–2.0
Neutralization No	0.02–0.25

An example of a preferred embodiment of my invention is a tinning oil composed of:

	Per cent
Stannous chloride	1.0
Palm oil	10.0
Mineral oil	Balance

I have found this composition to provide an optimum balance of initial and operating costs. The oil is used on the tin pot in the same manner as palm oil, new oil being added from time to time as conditions require.

While I have described a specific embodiment of my invention, it will be understood that I do not wish to be limited exactly thereto, but only by the scope of the appended claims.

I claim:

1. A tin-pot oil consisting of a major portion of a mineral oil having a flash point greater than 500° F.; at least about 5% by weight of fatty oil selected from the group consisting of palm oil, castor oil, tallow, hydrogenated corn, cottonseed, coconut and fish oil; and at least 0.25% by weight of stannous chloride.

2. A tin-pot oil consisting of a major portion of a mineral oil having a flash point greater than 500° F.; at least about 5% by weight of palm oil; and at least 0.25% by weight of stannous chloride.

3. A tin-pot oil consisting of between 0.75% and 2.0% by weight of stannous chloride, about 10% palm oil, and the balance mineral oil.

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