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**2,790,778**

## RUST PREVENTIVE COMPOSITIONS CONTAINING AMIDODICARBOXYLIC ACIDS

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This invention relates to rust preventive oleaginous compositions. More particularly the invention relates to the use of certain nitrogenous corrosion or rust inhibitors in compositions containing predominantly an oleaginous vehicle, and which compositions may become contaminated with water or steam.

The prevention of rust formation is particularly important in the protection of metal surfaces, particularly ferrous surfaces, where such surfaces are to be lubricated in the presence of contaminating moisture. Moisture may enter lubricating systems of land and marine turbine engines, for example, by leakage through steam glands and through water-cooled heat exchangers or simply by condensation from the atmosphere. The presence of rust is injurious because it causes excessive wear of gears and bearing surfaces, and may also clog the hydraulic governor system, which last result may lead to dangerous operating speeds. Furthermore, the presence of rust has been shown to increase the rate of oxidative breakdown of the lubricant. The prevention of rusting is also essential in the moving parts of hydraulic systems generally, such as hydraulic baling machinery, presses, etc. Other important applications of rust preventive compounds are in preservative oils, slushing oils, flushing oils, etc.

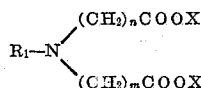
A great many materials have been proposed for the prevention of rust formation of metal surfaces, however, relatively few have been applicable in practice for the protection of lubricant systems because most are deleterious to the lubricant, the lubricant system, or are disadvantageous in some other way. It has been proposed to add various carboxylic acid amides to hydrocarbon oils either for rust prevention or in order to improve the film strength and adhesion to metals. U. S. Patent No. 2,462,358 incorporates an acetoacetyl amide whose acyl residue is that of a higher fatty acid or naphthenic acid, such as  $C_{17}H_{37}CONHC_2H_4NHCOCH_2COCH_3$ , for the latter purpose. And U. S. Patent No. 2,124,628 discloses the incorporation of the alkenyl succinic acids as a rust-proofing composition.

According to the present invention, it has now been found that the corrosive effect of lubricating oils and greases (oleaginous vehicle) upon bearing surfaces, gears and other metallic parts in the presence of water may be prevented by the incorporation in said oleaginous vehicle of a small amount of a new class of compounds, which are amidodicarboxylic acids and their salts in which a high molecular weight aliphatic acid residue is bound to the amide nitrogen which is also substituted by two carboxyalkyl groups. Such compounds, it has been determined on a scientific basis, effectively prevent the rusting of metal surfaces, particularly those of ferrous metals, upon exposure to water or steam, when used in small amounts in lubricating compositions. These additives moreover prevent rusting without influencing the lubricant action disadvantageously.

The rust preventive compositions of this invention consist of major amounts of an oleaginous vehicle and a

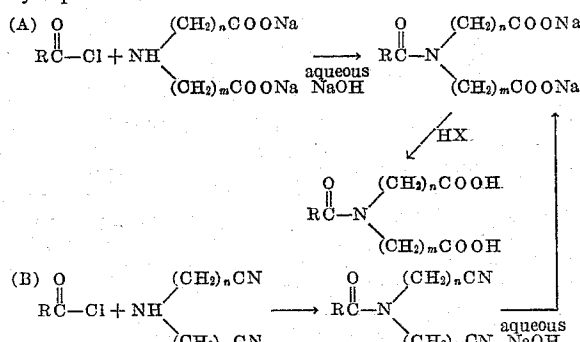
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minor amount of the class of compounds amidodicarboxylic acids and their salts having the empirical formula



where  $R_1$  represents an aliphatic carboxylic acid residue of  $C_8-C_{24}$ ,  $n$  and  $m$  represent 1 or 2 respectively, and  $X$  represents H or groups capable of forming salts with the carboxylic acid groups, such as ammonium groups, metals, etc. Another name for this class of compounds is the acyl iminodiacetic acid of high molecular weight aliphatic acids, the acyl radical attached to the amide nitrogen having 8 to 24 inclusive carbon atoms.  $R_1$  can also be one of the following groups: alkyl phosphoryl, alkyl phosphonyl, alkyl sulfonyl or alkyl sulfuryl, where the alkyl radical has this same number of carbon atoms as the aliphatic acid radical. The higher molecular weight acid in the amide group can be any of the higher fatty acids, either saturated or olefinic unsaturated, of this chain length, such as from caprylic acid through behenic in the saturated series. Many of these higher saturated and unsaturated fatty acids occur as glycerides in fats and oils in nature or as esters of monohydric alcohols in waxes. But higher molecular weight aliphatic acids within this general class which do not occur naturally, such as the mixed carboxylic acids in oxidized liquid or solid hydrocarbons, can be used. It will be understood that mixed acids can be used of any of these sources, i. e., mixed higher fatty acids or the synthetic mixed aliphatic acids from hydrocarbon oxidation, or mixtures of each, etc.

These amidodicarboxylic acids and their salts which are the additives of the present invention can be prepared in a number of ways. They may be prepared as indicated by Equations A or B.



The members of this class of compounds can be used alone in an oleaginous vehicle or solvent. The latter may be termed the lubricating oil or grease when this designation is thought of broadly. When used in an oleaginous vehicle, these compounds should be soluble, miscible or dispersible in the vehicle. If the amidodicarboxylic acid or its salts are not soluble therein, at least in the percentage added, solubilizers may be added which bring this about; a suitable agent for this purpose is disclosed subsequently. The term "oleaginous vehicle" as used in the specification and claims includes mineral lubricating oils derived from the refinement of petroleum or any of the so-called non-mineral oils, such as animal and vegetable oils, fats, the synthetic polyesters of organic acids, polysiloxane, polyalkylene glycols, polyolefins, also the rust-proof bases which may be used as the medium of application of rust preventive additive to the metal surface.

Some members of the lubricating oil base will be preferred for specific applications while other members will be preferred for other technical, industrial applications, where rust prevention is the objective. For it is obvious

that the type of lubricating oil or grease for such surfaces as machine parts, piston rings, machine guns, light arms, gears, turbines, and the moving parts of hydraulic baling machinery, presses, or metal drums, etc., will vary greatly. As to the selection of the acyl imino diacetic acid additive, the conditions of use of the finished lubricant and/or the type of oleaginous vehicle will dictate or influence the selection.

The amount of corrosion inhibitor incorporated in the finished lubricating composition may be very small, amounts of the order of 0.0125%–1%, based on the total finished oil lubricant, being sufficient to secure metallic corrosion prevention, more particularly where the surface is ferrous in nature. Greater amounts may be added as dictated by particular requirements and economic consideration.

Some of the more important uses, as a rust preventative, of the various types of acyl iminodiacetic acids in this application, aside from rust prevention in turbine lubrication, which has been mentioned specifically, are the following: Metal drawing and forming operations, gears and bearings under conditions of extreme pressure, motor oil for internal combustion engines, and top cylinder lubricants.

The rust preventive effectiveness of liquid lubricant compositions may be demonstrated by a simple test developed by Zisman et al., known as the "static water drop corrosion test" and described in "Industrial and Engineering Chemistry," volume 41, page 137 ff. (1949), and set out in detail at that portion of this presentation following Example IV.

#### EXAMPLE I

40.7 grams of (N-stearoyl) iminodiacetonitrile was dispersed in 300 milliliters of water and warmed to 76° C., and aqueous sodium hydroxide (26 grams sodium hydroxide dissolved in 200 milliliters of water) added to the dispersion over a period of 18 minutes. During this period the reaction temperature rose to 87° C. The reaction mixture was heated at reflux, with stirring, for a total time of 3 hours, the evolved ammonia being swept out of the system by a stream of nitrogen gas. At this time no further evolution of ammonia could be detected and the reaction mixture was made acid to Congo red paper with 6N aqueous hydrochloric acid and extracted with ether. The ethereal solution was dried over anhydrous sodium sulfate. The ether was removed and the residue which weighed 45 grams was recrystallized from 450 milliliters of n-hexane. The white crystals which formed weighed 32 grams, melted at 92–96° C. and had a neutralization equivalent weight of 200.5. The theoretical neutralization equivalent weight of (N-stearoyl) iminodiacetic acid is 200. These physical characteristics and neutralization equivalent weight, as well as method of synthesis establish the white crystals as this compound.

To test the rust preventative effectiveness of the (N-stearoyl) iminodiacetic acid, a turbine grade mineral lubricating oil containing this added compound was subjected to the "static water drop corrosion test" described in detail below, with the result to be found under Table I.

#### EXAMPLE II

195 grams of disodiumiminodiacetate monohydrate was dissolved in 500 ml. of water. 376 grams of 80 percent oleoyl chloride and aqueous sodium hydroxide (77.3 grams dissolved in 328 milliliters of water) were added dropwise simultaneously over a period of 2 hours and 45 minutes at a reaction temperature of 60 to 70° C., maintaining the alkalinity of the mixture orange to mimosa yellow paper. After completion of the addition of reagents, the reaction mixture was stirred for an additional two hours at 80 to 85° C. to increase the fluidity and insure completion of the reaction. The reaction mixture was made acid to pH 2 with 6N hydrochloric acid and extracted with ether, the ethereal solution being dried over anhydrous sodium sulfate. The residue, 378 grams

after removal of ether, was then dissolved in 900 milliliters of warm ethylene dichloride, chilled and allowed to stand at 5 to 10° C. An oily top layer formed, which was separated, then freed of a small amount of ethylene dichloride by distillation at 5 mm. Hg. The residual (N-oleoyl) iminodiacetic acid had a neutralization equivalent weight of 207. The theoretical neutralization equivalent weight of (N-oleoyl) iminodiacetic acid is 199.

To test the rust preventive effectiveness of the (N-oleoyl) iminodiacetic acid, a turbine grade mineral lubricating oil containing this added compound was subjected to the "static water drop corrosion test" described in detail below, with the result to be found under Table I.

#### EXAMPLE III

195 grams of disodiumiminodiacetate monohydrate was dissolved in 500 milliliters of water and warmed to 50° C. 223 grams of 98 percent lauroyl chloride and aqueous sodium hydroxide (58.5 grams dissolved in 200 milliliters of water) were added dropwise simultaneously at a reaction temperature of 70° C. over a period of 3 hours, so that the alkalinity of the mixture was maintained above pH 11 as indicated by an orange test with mimosa-yellow test paper. The reaction paste was then stirred at 75° C. for 2 hours to insure completion of the reaction. It was then made acid to Congo red paper after cooling to 25° C. with 6N hydrochloric acid. The aqueous dispersion was extracted with ether, the ethereal solution being dried over anhydrous sodium sulfate. The residue from ether was recrystallized twice from n-hexane yielding 107 grams (34% of theory) of a white crystalline material which melted at 82–86° C. It had a neutralization equivalent weight of 153. The theoretical neutralization equivalent weight for (N-lauroyl) iminodiacetic acid is 158. These physical constants, as well as method of synthesis established this white crystalline material as this compound.

To test the rust preventive effectiveness of (N-lauroyl) iminodiacetic acid, a turbine grade lubricating oil containing this added compound was subjected to the "static water drop corrosion test" described in detail below, with the result to be found under Table I.

#### EXAMPLE IV

84.2 grams of "Alox 102" was dissolved in 250 milliliters of ethylene dichloride and 26 grams of thionyl chloride was added rapidly to this solution with stirring. The reaction solution was then heated at reflux for 5 hours under a current of nitrogen until sulfur dioxide could no longer be detected in the exit gases. This solution, which is primarily the acid chloride of the organic acids, will be referred to as (A) for convenience.

19 grams of iminodiacetonitrile was dissolved in 250 milliliters of ethylene dichloride by warming and added rapidly to solution (A). The reaction mixture was then heated and stirred over reflux for 5 hours and was swept through with nitrogen gas until hydrogen chloride could no longer be detected in the exit gases. This solution, for convenience referred to as (B), is the (N-"Alox") iminodiacetonitrile.

One half of solution (B) was freed of ethylene dichloride by distillation. The residue was then dispersed in 100 milliliters of water containing 16 grams of sodium hydroxide and the dispersion heated at reflux for 2 3/4 hours until 171.2 milliequivalents of ammonia had been swept through by a stream of nitrogen gas (or 87% of theory). The reaction mixture was made acid to pH 2 with 6N hydrochloric acid and extracted with ethylene dichloride. The ethylene dichloride solution was washed with water to pH 5, then distilled to remove ethylene dichloride, yielding 30 grams of a tarry residue which was solution in aqueous alkali. The tarry product had a neutralization equivalent weight of 386. This is, therefore, believed to be (N-"Alox") iminodiacetic acid.

"Alox 102" is identified as a product under Table I.

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To test the result preventive effectiveness of "Alox"-iminodiacetic acid, a turbine grade lubricating oil containing this added compound was subjected to the "static water drop corrosion test" described in detail below, with the result to be found under Table I.

The synthesized amidodicarboxylic acid products described in the above examples were each tested by the "static water drop corrosion test" referred to supra for their rust preventive properties, as has been mentioned. To this end each was dissolved in a solvent-refined and filtered non-additive turbine grade mineral lubricating oil of 150 Saybolt Universal seconds viscosity at 100° F. and observations subsequently made on these oil solutions. This will be described now in detail. Briefly, the test consists essentially of observing rusting at 140° F. in the presence of liquid water in the dimple of a triangular cold-rolled steel specimen immersed in the test oil. An effective rust preventive oil will prevent rusting for several days, while straight mineral oils permit rusting to occur within 2 hours of test.

Solubilization of these amido dicarboxylic acids synthesized in the above example was effected by the addition of a solubilization agent which per se in oil solution had little, if any, rust preventive properties. The agent used was "Primene JMR," a commercially available primary, aliphatic amine, which has a tertiary-alkylamine structure, the tertiary groups having from 18 to 24 carbon atoms. It is marketed by Rohm and Haas Company.

The results of these tests are given in Table I.

Table I.—Rust preventive properties of amidodicarboxylic acids in lubricating oil

| Additive (A)                              | Example No. (A) | Wt. per-cent. (A) | Wt. per-cent. "Primene" | "Static Water Drop Corrosion Test" Time to Rust (Hours) |
|-------------------------------------------|-----------------|-------------------|-------------------------|---------------------------------------------------------|
| Base Oil—Turbine Grade Oil                | -----           | None              | None                    | Less than 16.                                           |
| Stearic acid                              | -----           | 0.20              | None                    | Do.                                                     |
| "Primene JMR" <sup>1</sup>                | -----           | None              | 0.20                    | Do.                                                     |
| Stearic acid + "Primene JMR"              | -----           | 0.20              | 0.20                    | Less than 2.                                            |
| (N-stearoyl) iminodiacetic acid.          | I               | 0.0125            | 0.0125                  | More than 200.                                          |
| (N-oleoyl) iminodiacetic acid.            | II              | 0.0125            | 0.0125                  | Do.                                                     |
| (N-lauroyl) iminodiacetic acid.           | III             | 0.0125            | 0.0125                  | Do.                                                     |
| (N-Alox) iminodiacetic acid. <sup>2</sup> | IV              | 0.0125            | 0.0125                  | Do.                                                     |

#### NOTES:

<sup>1</sup> "Primene JMR" is a mixture of highly branched, aliphatic primary amines having the tertiary-alkylamine structure in which the primary amino nitrogen is directly attached to a tertiary carbon atom; it is composed principally of amines from eighteen to twenty-four carbon atoms and the predominant portion may be represented by the formula,  $t-C_{18-24}H_{37-49}NH_2$ . It contains about 8-10% non-amine material. It is a non-viscous liquid, colorless to straw colored, insoluble in water and does not dissolve water to an appreciable extent. It exhibits solubility in hydrocarbon solvents and glyceride oils or fats, and in other organic liquids previously referred to under the term "oleaginous vehicles." Additional physical properties are:

|                              |                                                            |
|------------------------------|------------------------------------------------------------|
| Formula                      | Principally $t-C_{18}H_{37}NH_2$ to $t-C_{24}H_{49}NH_2$ . |
| Molecular Weight             | Principally 260-353.                                       |
| Specific Gravity, 25° C.     | 0.828.                                                     |
| Refractive Index, 25° C.     | 1.455.                                                     |
| Boiling Point (or Range)     | 5-95% at 274-340° C. (765 mm.).                            |
| Neutralization Equivalent    | 301.                                                       |
| Flash Point (Tag., open cup) | 250° F.                                                    |
| Color, Varnish Scale         | 4-.                                                        |

<sup>2</sup> "Alox 102" is a product of the Alox Corporation, derived by the oxidation of a petroleum hydrocarbon fraction, wherein the oxidized product has a high concentration of mixed organic acids but there are present other components than carboxylic acids. A representative product has a neutralization equivalent weight of 421 when titrated in isopropyl alcohol with 0.1 N standard potassium hydroxide to a phenolphthalein end point.

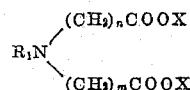
It is evident that the rust preventive effectiveness of lubricating oil solutions of amidodicarboxylic acids is much improved over the base oil alone or with the solubilizer in it. It is also evident that the amidodicarboxylic acids are qualitatively superior in rust preventive effectiveness than a typical high molecular weight fatty acid, such as stearic acid or the latter admixed with the identical solubilizer.

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While the utility of our invention is illustrated by reference to its adaptability to turbine grade mineral lubricating oils, it is to be understood that this is intended to be merely illustrative and not a limitation of the scope thereof. Thus our invention is applicable to other oils, whether or not comparable in specification and origin, including emulsifiable soluble oils, liquid fuels, greases, and in general compositions in connection with which the water-corrosion of the containing system is to be avoided.

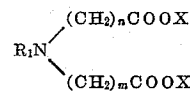
Having disclosed the nature of our invention and the manner in which it may be practiced, what we claim and desire to protect by Letters Patent are the following:

1. A rust-inhibited oleaginous composition adapted for use in the presence of water in systems containing metal susceptible to corrosion by said water comprising an oleaginous vehicle and an amidodicarboxylic acid having the general formula



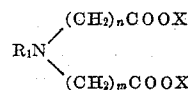
where  $R_1$  represents an aliphatic carboxylic acid residue of 8-24 carbon atoms ( $RC \leq O$ ),  $n$  and  $m$  represent digits 1-2 respectively, and  $X$  represents H and groups capable of forming salts with the carboxylic acid group, said amidodicarboxylic acid being present in said oleaginous composition in minor amounts, as little as a fraction of 1% to amounts greater than 1% but in sufficient quantity to inhibit the corrosion of said metal to a great degree when compared with the check.

2. A rust-inhibited oil composition adapted for use in the presence of water in systems containing metal susceptible to corrosion by said water comprising a hydrocarbon oil and an amidodicarboxylic acid having the general formula



where  $R_1$  represents an aliphatic carboxylic acid residue of 8-24 carbon atoms ( $RC \leq O$ ),  $n$  and  $m$  represent digits 1-2 respectively, and  $X$  represents H and groups capable of forming salts with the carboxylic acid group, said amidodicarboxylic acid being present in said oil composition in minor amounts, as little as a fraction of 1% to amounts greater than 1% but in sufficient quantity to inhibit the corrosion of said metal to a great degree when compared with the check.

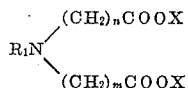
3. A rust-inhibited oleaginous composition adapted for use in the presence of water in systems containing metal susceptible to corrosion by said water comprising an oleaginous vehicle and an amidodicarboxylic acid having the general formula



where  $R_1$  represents an aliphatic carboxylic acid residue of 8-24 carbon atoms ( $RC \leq O$ ),  $n$  and  $m$  represent digits 1-2 respectively, and  $X$  represents H and groups capable of forming salts with the carboxylic acid group, said amidodicarboxylic acid being present in said oleaginous composition in minor amounts, as little as a fraction of 1% to amounts greater than 1% but in sufficient quantity to inhibit the corrosion of said metal to a great degree when compared with the check, and alkyl primary amines having 18-24 carbon atoms in sufficient amount to solubilize said amidodicarboxylic acid, in the oleaginous vehicle, the said alkyl primary amines being

soluble in hydrocarbon oil and oleaginous vehicles but insoluble in water.

4. A rust-inhibited oil composition adapted for use in the presence of water in systems containing metal susceptible to corrosion by said water comprising a hydrocarbon oil and an amidodicarboxylic acid having the general formula



where R<sub>1</sub> represents an aliphatic carboxylic acid residue of 8-24 carbon atoms (RC≤O), n and m represent digits 1-2 respectively, and X represents H and groups capable of forming salts with the carboxylic acid group, said amidodicarboxylic acid being present in said oil composition in minor amounts, as little as a fraction of 1% to amounts greater than 1% but in sufficient quantity to inhibit the corrosion of said metal to a great degree when compared with the check, and alkyl primary amines having 18-24 carbon atoms in sufficient amount to solubilize said amidodicarboxylic acid, in the hydrocarbon oil, the said primary amines being soluble in the hydrocarbon oil but insoluble in water.

5. A rust-inhibited oleaginous composition adapted for use in the presence of water in systems containing metal susceptible to corrosion by said water comprising an oleaginous vehicle and (N-stearoyl)iminodiacetic acid, said latter component being present in the oleaginous composition in minor amounts, as little as a fraction of 1% to amounts greater than 1% calculated on the finished product but in sufficient quantity to inhibit the corrosion of said metal to a great degree when compared with the check.

6. A rust-inhibited oil composition adapted for use in the presence of water in systems containing metal susceptible to corrosion by said water comprising a hydrocarbon oil and (N-stearoyl)iminodiacetic acid, said latter component being present in the oil composition in minor amounts, as little as a fraction of 1% to amounts greater than 1% calculated on the finished product but in sufficient quantity to inhibit the corrosion of said metal to a great degree when compared with the check.

7. A rust-inhibited oleaginous composition adapted for use in the presence of water in systems containing metal susceptible to corrosion by said water comprising an oleaginous vehicle and (N-oleoyl)iminodiacetic acid, said latter component being present in the oleaginous composition in minor amounts, as little as a fraction of 1% to amounts greater than 1% calculated on the finished product but in sufficient quantity to inhibit the corrosion of said metal to a great degree when compared with the check.

8. A rust-inhibited oil composition adapted for use in the presence of water in systems containing metal susceptible to corrosion by said water comprising a hydrocarbon oil and (N-oleoyl)iminodiacetic acid, said latter component being in the oil composition in minor amounts, as little as a fraction of 1% to amounts greater than 1% calculated on the finished product but in sufficient quantity to inhibit the corrosion of said metal to a great degree when compared with the check.

9. A rust-inhibited oleaginous composition adapted for use in the presence of water in systems containing metal susceptible to corrosion by said water comprising an oleaginous vehicle and (N-lauroyl)iminodiacetic acid, said latter component being present in the oleaginous composition in minor amounts, as little as a fraction of 1% to amounts greater than 1% calculated on the finished product but in sufficient quantity to inhibit the corrosion of said metal to a great degree when compared with the check.

10. A rust-inhibited oil composition adapted for use

in the presence of water in systems containing metal susceptible to corrosion by said water comprising a hydrocarbon oil and (N-lauroyl)iminodiacetic acid, said latter component being present in the oil composition in minor amounts, as little as a fraction of 1% to amounts greater than 1% calculated on the finished product but in sufficient quantity to inhibit the corrosion of said metal to a great degree when compared with the check.

11. A rust-inhibited oleaginous composition adapted for use in the presence of water in systems containing metal susceptible to corrosion by said water comprising an oleaginous vehicle and (N-acyl)iminodiacetic acid, whose said acyl group represents mixed organic acids obtained by the oxidation of a petroleum hydrocarbon and having a neutralization equivalent weight of about 421 to phenolphthalein neutralization, said (N-acyl)iminodiacetic acid being present in the said oil composition in minor amounts, as little as a fraction of 1% to amounts greater than 1% but in sufficient quantity to inhibit the corrosion of said metal to a great degree when compared with the check.

12. A rust-inhibited oil composition adapted for use in the presence of water in systems containing metal susceptible to corrosion by said water comprising a hydrocarbon oil and (N-acyl)iminodiacetic acid, whose said acyl group represents mixed organic acids obtained by the oxidation of a petroleum hydrocarbon and having a neutralization equivalent weight of about 421 to phenolphthalein neutralization, said (N-acyl)iminodiacetic acid being present in the said oil composition in minor amounts, as little as a fraction of 1% to amounts greater than 1% but in sufficient quantity to inhibit the corrosion of said metal to a great degree when compared with the check.

13. A rust-inhibited oil composition adapted for use in the presence of water, in systems containing metal susceptible to corrosion by said water, comprising a hydrocarbon oil, a minor amount of (N-stearoyl)iminodiacetic acid of as little as a fraction of 1% to amounts greater than 1% but in a sufficient quantity to inhibit corrosion of said metal to a great degree when compared with the check, and alkyl primary amines having 18-24 carbon atoms in sufficient amount to solubilize said (N-stearoyl)iminodiacetic acid, in the hydrocarbon oil, the said alkyl primary amines being soluble in the hydrocarbon oil but insoluble in water.

14. A rust-inhibited oil composition adapted for use in the presence of water, in systems containing metal susceptible to corrosion by said water, comprising a hydrocarbon oil, a minor amount of (N-oleoyl)iminodiacetic acid, as little as a fraction of 1% to amounts greater than 1% but in a sufficient quantity to inhibit corrosion of said metal to a great degree when compared with the check, and alkyl primary amines having 18-24 carbon atoms in sufficient amount to solubilize said (N-oleoyl)iminodiacetic acid, in the hydrocarbon oil, the said alkyl primary amines being soluble in the hydrocarbon oil but insoluble in water.

15. A rust-inhibited oil composition adapted for use in the presence of water, in systems containing metal susceptible to corrosion by said water, comprising a hydrocarbon oil, a minor amount of (N-lauroyl)iminodiacetic acid, as little as a fraction of 1% to amounts greater than 1% but in a sufficient quantity to inhibit corrosion of said metal to a great degree when compared with the check, and alkyl primary amines having 18-24 carbon atoms in sufficient amount to solubilize said (N-lauroyl)iminodiacetic acid, in the hydrocarbon oil, the said alkyl primary amines being soluble in the hydrocarbon oil but insoluble in water.

16. A rust-inhibited oil composition adapted for use in the presence of water in systems containing metal susceptible to corrosion by said water comprising a hydrocarbon oil and (N-acyl)iminodiacetic acid, whose said

acyl group represents mixed organic acids obtained by the oxidation of a petroleum hydrocarbon and having a neutralization equivalent weight of about 421 to phenolphthalein neutralization, said (N-acyl) iminodiacetic acid being present in the said oil composition in minor amounts, as little as a fraction of 1% to amounts greater than 1% but in sufficient quantity to inhibit the corrosion of said metal to a great degree when compared with the check, and alkyl primary amines having 18-24 carbon atoms in sufficient amount to solubilize said (N-acyl)

iminodiacetic acid, in the hydrocarbon oil, the said alkyl primary amines being soluble in the hydrocarbon oil but insoluble in water.

**References Cited in the file of this patent****UNITED STATES PATENTS**

|           |              |               |
|-----------|--------------|---------------|
| 2,368,604 | White        | Jan. 30, 1945 |
| 2,638,449 | White et al. | May 12, 1953  |