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Yoshii(10) **Pub. No.: US 2016/0137948 A1**(43) **Pub. Date: May 19, 2016**(54) **LUBRICANT COMPOSITION FOR CHAINS,
AND CHAIN****Publication Classification**(71) Applicant: **TSUBAKIMOTO CHAIN CO.,**
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129/70 (2013.01); **C10M 169/00** (2013.01)(57) **ABSTRACT**

A lubricant composition for a chain contains a base oil, a thickener, and an anticorrosive agent. The lubricant composition has a sulfur content of not more than 100 ppm by mass, a phosphorus content of not more than 1 mass %, and an aromatic content of not more than 1 mass %.

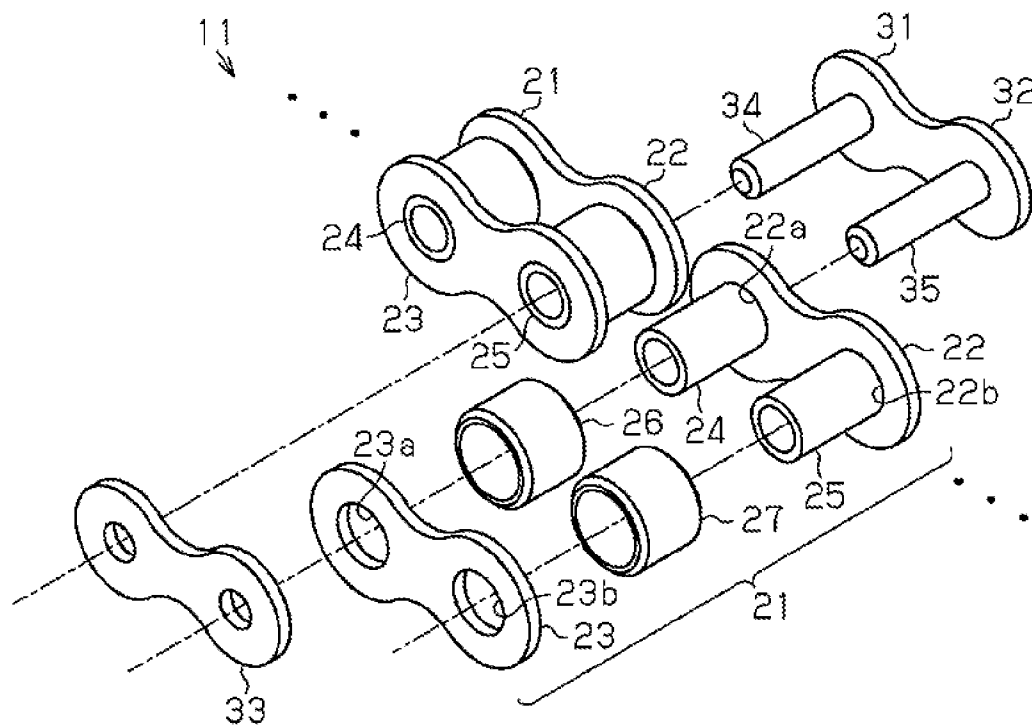


Fig.1

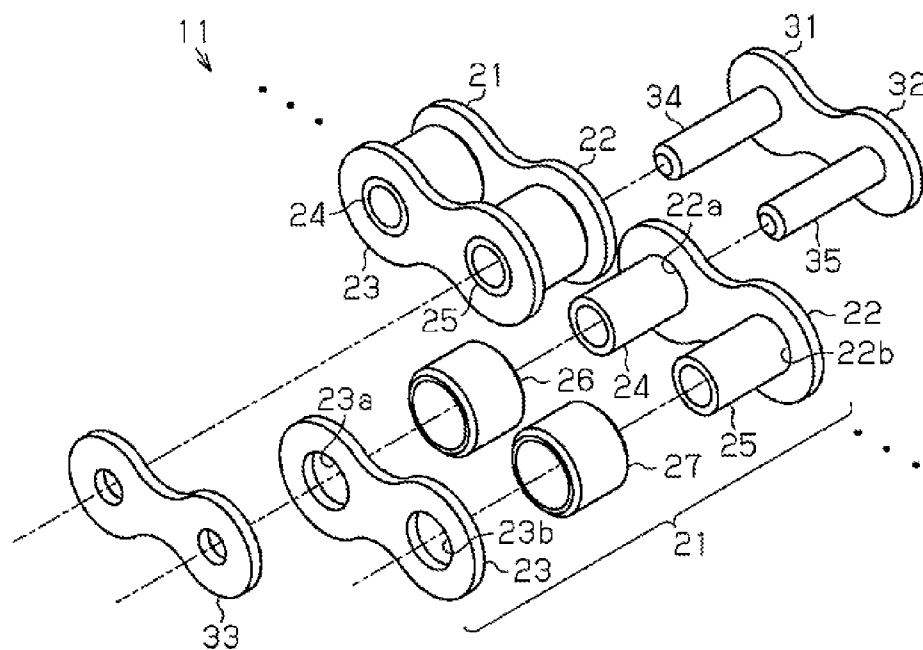
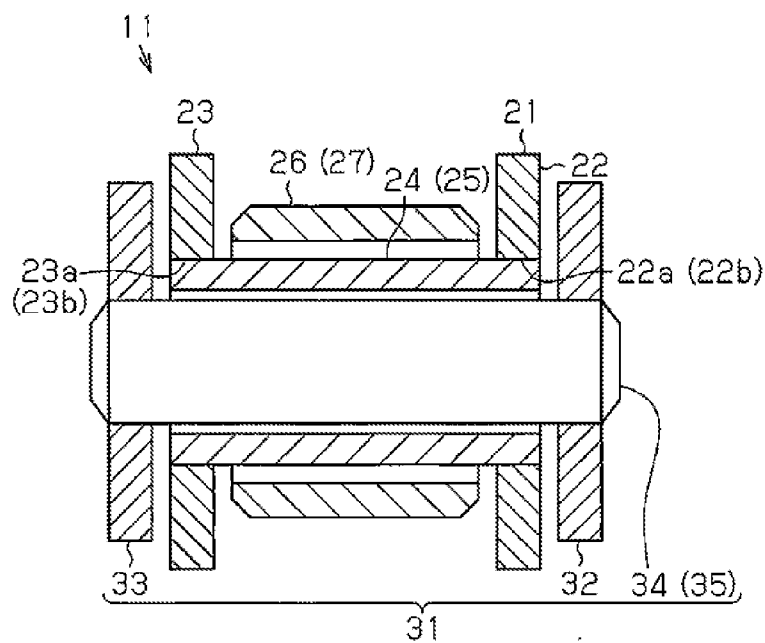


Fig.2



LUBRICANT COMPOSITION FOR CHAINS, AND CHAIN

TECHNICAL FIELD

[0001] The present invention relates to a lubricant composition for a chain and a chain applied with the same.

BACKGROUND ART

[0002] A lubricant composition for a chain containing a base oil and a thickener has been known. For example, Patent Document 1 discloses a lubricant composition containing a wax as a thickener. The lubricant composition has a consistency of 60 to 475 and a drop point of 60° C. to 120° C. when measured by the measuring methods according to the Japanese Industrial Standard (JIS) K 2220.

PRIOR ART DOCUMENT

Patent Document

[0003] Patent Document 1: Japanese Laid-Open Patent Publication No. 2009-144005

SUMMARY OF THE INVENTION

Problems that are to be Solved by the Invention

[0004] The appearance of a chain is occasionally compromised by blackening of a lubricant composition applied to the chain. Further, if a blackened lubricant composition scatters around the area in use of the chain, stains are apt to be visible clearly. Patent Document 1 does not teach anything about improvement of blackening of a chain.

[0005] An object of the present invention is to provide a lubricant composition for a chain that can suppress blackening of a chain, and a chain applied with the lubricant composition.

Means for Solving the Problem

[0006] According to an aspect of the present invention, a lubricant composition for a chain comprises a base oil, a thickener, and an anticorrosive agent, wherein the lubricant composition has a sulfur content of not more than 100 ppm, a phosphorus content of not more than 1 mass %, and an aromatic content of not more than 1 mass %.

[0007] The present inventor has discovered that a lubricant composition containing at least one of sulfur, phosphorus, and aromatic components at a predetermined concentration or more blackens easily by heating. In other words, when a lubricant composition has a sulfur content of not more than 100 ppm by mass, a phosphorus content of not more than 1 mass %, and an aromatic content of not more than 1 mass %, the blackening to be caused by the sulfur, phosphorus, and aromatic components is suppressed.

[0008] Preferably, the lubricant composition further comprises an oily agent, the oily agent preferably comprising a compound having a sulfur content of not more than 100 ppm, a phosphorus content of not more than 1 mass %, and an aromatic content of not more than 1 mass %.

[0009] Preferably, in the lubricant composition, the oily agent comprises at least one selected from a fatty acid ester and a lanolin fatty acid alcohol ester.

[0010] The lubricant composition is preferably for use in a vessel for dipping a chain.

[0011] According to another aspect of the present invention, a chain applied with the lubricant composition is provided.

Effect of the Invention

[0012] According to the present invention, blackening of a chain can be suppressed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] FIG. 1 is a schematic exploded perspective view of part of a chain of an embodiment.

[0014] FIG. 2 is a schematic partial cross-sectional view of a chain.

MODES FOR CARRYING OUT THE INVENTION

[0015] One embodiment of the lubricant composition and the chain will be described below.

[0016] The lubricant composition contains a base oil, a thickener, and an anticorrosive agent. The lubricant composition has a sulfur content of not more than 100 ppm by mass, a phosphorus content of not more than 1 mass %, and an aromatic content of not more than 1 mass %.

<Base Oil>

[0017] It is preferable that the base oil has a sulfur content of not more than 100 ppm by mass, a phosphorus content of not more than 1 mass %, and an aromatic content of not more than 1 mass %. The base oil is preferably at least one selected from a mineral oil and a synthetic oil. A mineral oil that has a low sulfur content and substantially no phosphorus and aromatic components is suitable. Such a mineral oil can be selected from commercially-supplied process oils. Components of the mineral oil can include a paraffinic hydrocarbon such as liquid paraffin. The paraffinic hydrocarbon has a paraffinic carbon content (% CP) of 50 or higher determined by a ring analysis using the n-d-M method.

[0018] Examples of the synthetic oil include synthetic hydrocarbons (such as poly- α -olefins (PAOs), co-oligomers of ethylene and an α -olefins, and polybutene), esters, polyphenyl ethers, polyalkylene glycols, silicones, and fluorocarbons. Examples of the esters include hindered esters (such as dibasic acid esters and polyolesters), diesters, and silicate esters.

[0019] The lubricant composition may contain one or more base oils.

[0020] The content of the base oil in the lubricant composition is preferably 70 mass % or more.

<Thickener>

[0021] The thickener is in a solid state at normal temperature (25° C.). When dispersed or dissolved in the base oil, the thickener increases the viscosity of the base oil. The thickener preferably comprises a compound having a sulfur content of not more than 100 ppm by mass, a phosphorus content of not more than 1 mass %, and an aromatic content of not more than 1 mass %. At least one selected from a polymerized polyethylene wax and a polymer is preferably used as the thickener. Examples of the polymer include polymethacrylate and polyisobutylene.

[0022] The lubricant composition may contain one or more thickeners.

[0023] The content of the thickener in the lubricant composition is preferably 1 mass % or more. The content of the thickener in the lubricant composition is preferably 25 mass % or less.

<Anticorrosive Agent>

[0024] The anticorrosive agent preferably comprises a compound having a sulfur content of not more than 100 ppm by mass, a phosphorus content of not more than 1 mass %, and an aromatic content of not more than 1 mass %. Examples of the favorably usable anticorrosive agent include a sorbitan-based anticorrosive agent, a lanolin-based anticorrosive agent, a succinic acid-based anticorrosive agent, an amine-based anticorrosive agent, and a metal soap.

[0025] Examples of the sorbitan-based anticorrosive agent include sorbitan fatty acid esters (such as sorbitan monooleate and sorbitan tristearate).

[0026] Examples of the lanolin-based anticorrosive agent include lanolin fatty alcohols and lanolin fatty acid alcohol esters.

[0027] Examples of the succinic acid-based anticorrosive agent include alkyl succinic acid derivatives such as alkyl succinic anhydrides.

[0028] Examples of the amine-based anticorrosive agent include amine salts of organic acids and amine salts of fatty acids.

[0029] Examples of the metal soap include a lanolin fatty acid soap.

[0030] The lubricant composition may contain one or more anticorrosive agents. The anticorrosive agent preferably contains a sorbitan fatty acid ester.

[0031] The content of the anticorrosive agent in the lubricant composition is preferably 1 mass % or more. The content of the anticorrosive agent in the lubricant composition is preferably mass % or less.

<Other Components>

[0032] An oily agent may be added to the lubricant composition.

[0033] The oily agent preferably comprises a compound having a sulfur content of not more than 100 ppm by mass, a phosphorus content of not more than 1 mass %, and an aromatic content of not more than 1 mass %.

[0034] Examples of the oily agent include fatty acid esters, lanolin fatty acid alcohol esters, long-chain fatty acids, long-chain fatty acid salts, organic alcohols, and alkyl amines. The fatty acid esters may be represented by the following general formula (1).



[0035] wherein R^1 is a C_7 - C_{18} saturated or unsaturated alkyl group and R^2 is a C_1 - C_4 alkyl group.

[0036] Examples of the lanolin fatty acid alcohol ester include lanolin fatty acid-lanolin alcohol esters (trade name: ECOLANO LY, LC, manufactured by Nippon Fine Chemical Co., Ltd.) and lanolin fatty acid pentaerythritol esters (trade name: NEOCOAT EPS-2, EPS-24, manufactured by Nippon Fine Chemical Co., Ltd.). The lanolin fatty acid alcohol ester also has a function of enhancing the anticorrosive effect.

[0037] Examples of the long-chain fatty acid include C_7 - C_{17} saturated or unsaturated fatty acids. Examples of the long-chain fatty acid include stearic acid and oleic acid. Examples of the organic alcohol include lauryl alcohol. Examples of the alkyl amine include stearyl amine.

[0038] The lubricant composition may contain one or more oily agents.

[0039] The lubricant composition preferably contains the oily agent. It is more preferable that the oily agent comprises at least one selected from a fatty acid ester and a lanolin fatty acid alcohol ester.

[0040] The content of the oily agent in the lubricant composition is preferably in a range between 1 mass % and 10 mass %. More preferably, the lubricant composition contains a fatty acid ester in a range between 1 mass % and 10 mass %.

[0041] If necessary, an extreme-pressure agent, an antioxidant, and a defoaming agent may be added to the lubricant composition.

<Sulfur, Phosphorus, and Aromatic Contents in the Lubricant Composition>

[0042] The sulfur content in the lubricant composition can be determined quantitatively, for example, by the method set forth in JIS K2541. The phosphorus content in the lubricant composition can be determined quantitatively, for example, by plasma emission spectrometry. The aromatic content in the lubricant composition can be determined quantitatively, for example, by a ring analysis using the n-d-M method.

<Preparation Method of the Lubricant Composition>

[0043] The lubricant composition is prepared by mixing a base oil, a thickener, and an anticorrosive agent with a well-known stirrer. The oily agent, etc. may be simultaneously added to the lubricant composition as needed. The preparation of the lubricant composition is preferably carried out at or above the melting temperature of the thickener.

<Structure of the Chain>

[0044] As shown in FIG. 1, a chain 11 of the embodiment is a roller chain configured such that an inner link 21 and an outer link 31 adjacent to each other are pivotally interconnected.

[0045] The inner link 21 has two inner plates 22, 23 facing each other, cylindrical bushings 24, 25 supporting the inner plates 22, 23, and cylindrical rollers 26, 27 located rotationally around the bushings 24, 25.

[0046] The inner plates 22, 23 are retained apart from each other due to linkage with the bushings 24, 25.

[0047] The inner plate 22 has through-holes 22a, 22b at both ends in the longitudinal direction of the chain 11. Likewise, the inner plate 23 has through-holes 23a, 23b at both ends. The hole of the bushing 24 goes through the through-holes 22a, 23a and opens at the external surfaces, which are opposite to the surfaces facing each other, of the inner plates 22, 23. Likewise, the hole of the bushing 25 goes through the through-holes 22b, 23b and opens at the external surfaces, which are opposite to the surfaces facing each other, of the inner plates 22, 23.

[0048] The outer link 31 has two outer plates 32, 33 facing each other, and two solid cylindrical pins 34, 35 connecting the outer plates 32, 33. The outer plates 32, 33 are retained apart from each other due to linkage with the pins 34, 35.

[0049] The pins 34, 35 are inserted respectively into the bushing 25 of the inner link 21 and the bushing 24 of another inner link 21 placed adjacent to the former inner link 21. In this manner, two adjacent inner links 21 are connected via an outer link 31.

[0050] As shown in FIG. 2, there are gaps formed between the outer peripheries of the pins 34, 35 and the inner peripheries of the bushings 24, 25. The chain 11 may be formed, for example, from a steel material.

<Use and Effect of the Lubricant Composition>

[0051] The lubricant composition is applied to the chain 11, for example, by dipping the chain 11 in the lubricant composition to supply the lubricant composition between the outer peripheries of the pins 34, 35 and the inner peripheries of the bushings 24, 25. The lubricant composition is preferably kept at or above the melting temperature of the thickener during dipping. When the lubricant composition is heated to, for example, 100° C. or higher, the lubricant composition can easily flow in between the outer peripheries of the pins 34, and the inner peripheries of the bushings 24, 25.

[0052] For the dipping, a vessel for dipping the chain is used. In the vessel, the lubricant composition is kept in a heated state. After dipping in the heated lubricant composition for a predetermined time period, the chain 11 is transported out of the vessel, and then a new chain 11 is dipped in the lubricant composition in the vessel. In this manner, application of the lubricant composition to the chain 11, namely, lubrication, is repeated in the vessel for dipping a chain. Fresh lubricant composition is replenished to the vessel depending on the amount of the lubricant composition consumed by the application to the chains 11.

[0053] The lubricant composition of the embodiment contains substantially no or a very low concentration of sulfur, phosphorus, and aromatic components that may cause blackening. Therefore, even when the lubricant composition is kept in a heated state for a long period in the vessel for dipping a chain, blackening of the lubricant composition is suppressed. In other words, a lubricant composition of the embodiment can easily maintain its original color (for example, brown or light brown) in a heated state.

[0054] The chain 11 is used, for example, for conveying an article or transmission of power. The chain 11 is used, for example, in a state wound around a plurality of sprockets. In this case the lubricant composition lubricates, for example, the spaces between the outer peripheries of the pins 34, 35 and the inner peripheries of the bushings 24, 25.

[0055] The embodiment described above exhibits the following effects.

[0056] (1) The lubricant composition contains a base oil, a thickener, and an anticorrosive agent, and has a sulfur content of not more than 100 ppm by mass, a phosphorus content of not more than 1 mass %, and an aromatic content of not more than 1 mass %. With this constitution, blackening of the lubricant composition to be caused by sulfur, phosphorus, and aromatic components can be suppressed. Therefore, blackening of the chain 11 applied with the lubricant composition can be suppressed, and the chain 11 having favorable appearance can be obtained.

[0057] (2) The lubricant composition further contains an oily agent preferably comprising a compound having a sulfur content of not more than 100 ppm by mass, a phosphorus content of not more than 1 mass %, and an aromatic content of not more than 1 mass %. With this constitution, for example, even when the oily agent is added to the lubricant composition for improving the chain wear life, blackening of the chain 11 can be suppressed. It is suitable for the oily agent to contain, for example, at least one of a fatty acid ester and a lanolin fatty acid alcohol ester.

[0058] (3) The anticorrosive agent to be added to the lubricant composition preferably contains a sorbitan fatty acid ester. Among other anticorrosive agents, a sorbitan fatty acid ester can exhibit an anticorrosive effect in a relatively small amount. Since a sorbitan fatty acid ester contains substantially no sulfur, phosphorus, and aromatic components, blackening of the lubricant composition to be caused by sulfur, phosphorus, and aromatic components can be suppressed.

[0059] (4) A sorbitan fatty acid ester or a lanolin fatty acid alcohol ester has a function of inhibiting crystallization of the thickener in the lubricant composition. Therefore, even if the thickener is partially solidified in the lubricant composition, the solidified thickener remains hardly visible, and thus the appearance of the chain 11 is improved.

[0060] (5) The high temperature in the vessel for dipping a chain is one of the causes for the development of blackening of the lubricant composition. The lubricant composition of the embodiment is especially advantageous, because it is resistant to blackening in such a high temperature vessel for dipping a chain. For example, in the case of a lubricant composition that is not resistant to blackening, it becomes necessary that, when the lubricant composition in the vessel for dipping a chain blackens, the lubricant composition be replaced with a freshly prepared one. As the frequency of the replacement increases, the labor and cost for the replacement increase. However, since the lubricant composition of the embodiment is resistant to blackening, the frequency of the replacement of the lubricant composition caused by the blackening can be reduced.

Modified Embodiments

[0061] The embodiment described above may be modified as follows.

[0062] The sulfur content in the base oil added to the lubricant composition may exceed 100 ppm by mass. In this case, the sulfur content in the lubricant composition can be adjusted to 100 ppm by mass or less by, for example, employing substantially sulfur-free compounds as the thickener and the anticorrosive agent. In other words, at least one of the sulfur content, the phosphorus content, and the aromatic content in the ingredients of the lubricant composition may exceed the concentrations specified for the lubricant composition.

[0063] The chain to which the lubricant composition is applied is not limited to a roller chain but may be, for example, a bushing chain having no rollers 26, 27.

[0064] The lubricant composition of the above embodiment is applied to the chain 11 for so-called pre-lubrication purpose. However, the lubricant composition may also be applied for the purpose of maintenance of the chain 11 when the chain 11 is in use, namely, when the chain 11 is outside the vessel for dipping a chain. Even in such a case, blackening of the chain 11 to be caused by, for example, heat generation during use of the chain 11 or heating from the environment of use, can be suppressed.

Examples

[0065] Blackening tests on base oils, thickeners, anticorrosive agents, and other components were conducted as described below.

(Blackening Test on Base Oils)

[0066] The base oils shown in Table 1 were kept at 150° C. and the blackening was evaluated according to the following criteria:

[0067] no blackening even after an elapse of 2000 hours: excellent (A);

[0068] blackening occurred between 1000 hours (exclusive) and 2000 hours (inclusive): good (B);

[0069] blackening occurred between 100 hours (exclusive) and 1000 hours (inclusive): slightly inadequate (C);

[0070] blackening occurred within 100 hours (inclusive): inadequate (D).

[0071] The evaluation results are shown in Table 1.

TABLE 1

Base oils				
Classification	Component	Trade name	Manufacturer	Blackening test
Mineral Oil	Petroleum hydrocarbon	Vitrea Oil 10, 22, 32, 46, 68, 100, 150, 220, 320	Showa Shell Sekiyu K.K.	D
		Valvata Oil 460, 680, 1000	Showa Shell Sekiyu K.K.	D
		Shell Morlina S1 BJ	Showa Shell Sekiyu K.K.	D
		Super Oil M10, 12, 22, 32, 46, 68, 100, 150, 460	JX Nippon Oil & Energy Corporation	D
		Super Oil N7, 22, 32, 46, 56, 68, 100, 150, 320, 460, 1000	JX Nippon Oil & Energy Corporation	D
		Diana Fresia P32, 90, 150, 180, 430	Idemitsu Kosan Co., Ltd.	D
		SUNPAR OILs 110, 115, 150, 2100, 2280	Japan Sun Oil Company, Ltd.	D
		Sunpure LW70, P22, P32, P100	Japan Sun Oil Company, Ltd.	B
		Shell Ondina Oil	Showa Shell Sekiyu K.K.	B
		High White 70, 350, 22S	JX Nippon Oil & Energy Corporation	B
Highly purified mineral oil	Petroleum hydrocarbon	Daphne Oil CP, KP	Idemitsu Kosan Co., Ltd.	B
		Diana Process Oil PW32, 90, 150, 380	Idemitsu Kosan Co., Ltd.	B
		MORESCO WHITE P-40, 55, 60, 70, 80, 100, 120, 150, 200, 260, 350P	MORESCO	B
		MORESCO VIOLESS U-6, 7, 8	MORESCO	B
		LUCANT HC-40, 100, 600, 1100, 2000	Mitsui Chemicals, Inc.	A
		Durasyn 125, 126, 127, 128, 145, 146, 147, 148, 162, 164, 166, 168, 170, 174I, 180I, 180R	INEOS	A
Synthetic hydrocarbon	Co-oligomer of ethylene and α -olefin Poly- α -olefin			

[0072] The highly purified mineral oil contains substantially no phosphorus and aromatic components. The sulfur content in the highly purified mineral oil is several tens of ppm by mass or less. The synthetic hydrocarbon contains substantially none of sulfur, phosphorus, and aromatic components.

(Blackening Test on Thickeners)

[0073] The same blackening test and evaluation as described above for the base oils were conducted on the thickeners shown in Table 2. The results are shown in Table 2.

TABLE 2

Thickeners				
Classification	Component	Trade name	Manufacturer	Blackening test
Polymer	Poly-methacrylate	ACLUBE	Sanyo Chemical Industries, Ltd.	B
	Poly-isobutylene	TETRAX	JX Nippon Oil & Energy Corporation	B
Polyethylene wax	Polymerized polyethylene	MITSUMI Hi-WAX 100P, 200P, 400P, 800P	Mitsui Chemicals, Inc.	B
		MITSUMI Hi-WAX 110P, 210P, 220P, 320P, 410P, 420P, 720P	Mitsui Chemicals, Inc.	B

TABLE 2-continued

Thickeners				
Classification	Component	Trade name	Manufacturer	Blackening test
Oxidized polyethylene wax	Degraded polyethylene	EXCEREX 10500, 20700, 40800, 30200B, 30050B, 48070B	Mitsui Chemicals, Inc.	B
		Licowax PE 130, 190, 520, 810, 820, 830, 840	Clariant	B
		MTSUI Hi-WAX NL100, NL200, NL500, NL800	Mitsui Chemicals, Inc.	C
		SANWAX 171-P, 151-P, 131-P, 161-P, 161, 165-P	Sanyo Chemical Industries, Ltd.	C
	Oxidized polyethylene	SANWAX LEL-250, LEL-800, LEL-400P, E-310, E-330, E-250P	Sanyo Chemical Industries, Ltd.	C
		EXCEREX 15341PA	Mitsui Chemicals, Inc.	C
		PED-121, 153, 136, 521, 821, 522, 822, 191, 192, 1101	Clariant	C

(Blackening Test on Anticorrosive Agents)

[0074] The same blackening test and evaluation as described above for the base oils were conducted on the anticorrosive agents shown in Table 3. The results are shown in Table 3.

TABLE 3

Anticorrosive agents				
Classification	Component	Trade name	Manufacturer	Blackening test
Metal sulfonate	Metal sulfonate	SULFOL Ca-45N, Ca-45	MORESCO	D
		MORESCO AMBER SC45, SC-45N	MORESCO	D
		SULFOL Ba-30N	MORESCO	D
		MORESCO AMBER SB-50N	MORESCO	D
Sorbitan-based	Sorbitan fatty acid ester			B
Lanolin-based	Lanolin fatty alcohol			B
Succinic acid-based	Alkyl succinic acid derivative			A
Amine-based	Organic acid amine salt			C
		Fatty acid amine salt		C
Phosphoric ester	Phosphite			D
Metal soap	Lanolin fatty acid soap			B
Others	Oxidized paraffin			D

(Blackening Test on Other Components)

[0075] The same blackening test and evaluation as described above for the base oils were conducted on the oily agents and the extreme-pressure agents shown in Table 4. The results are shown in Table 4.

TABLE 4

Other components			
Classification	Component	Compound name	Blackening test
Oily agent	Long-chain fatty acid	Oleic acid	B
	Fatty acid ester	Butyl stearate	B
	Organic alcohol	Lauryl alcohol	B
	Amine	Stearyl amine	C
Extreme-pressure agent	Sulfurized olefin	Sulfurized isobutylene	D
	Sulfide	Dibenzyl sulfide	D
	Phosphite	Tributyl phosphite	C
	Phosphate	Tricresyl phosphate	C
		Amine phosphate	C

TABLE 4-continued

Other components			
Classification	Component	Compound name	Blackening test
	Dialkyldithiophosphate	Zn-dialkyldithiophosphate	D
	Dialkali dithiocarbamate	Methylene-bis(dibutyl dithiocarbamate)	D

[0076] Next, Examples will be described.

Examples 1 and 2

[0077] The lubricant composition of each Example was prepared by mixing the respective ingredients according to the composition shown in Table 5. In Table 5, the base oil is a highly purified mineral oil (trade name: Sunpure P100, manufactured by Japan Sun Oil Company, Ltd.), and the thickener is a polyethylene wax (MITSUI Hi-WAX 200P, manufactured by Mitsui Chemicals, Inc.). In Table 5, the anticorrosive agent is a sorbitan fatty acid ester, and the oily agent is a fatty acid ester. The lubricant composition of each Example was prepared such that the sulfur content was not more than 100 ppm by mass, the phosphorus content was not more than 1 mass %, and the aromatic content was not more than 1 mass %.

Comparative Examples 1 and 2

[0078] The lubricant composition of each Comparative Example was prepared by mixing the respective ingredients according to the composition shown in Table 5. As the extreme-pressure agent in Table 5, a sulfurized olefin was used in Comparative Example 1 and a dialkyl dithiophosphate was used in Comparative Example 2. The sulfur content in the lubricant composition of each Comparative Example was more than 100 ppm by mass.

TABLE 5

Lubricant compositions for chains					
	Base oil (parts by mass)	Thickener (parts by mass)	Anti- corrosive agent (parts by mass)	Oily agent (parts by mass)	Extreme- pressure agent (parts by mass)
Example 1	82	15	3	0	0
Example 2	75	15	3	7	0
Comparative Example 1	84.9	15	0	0	0.1
Comparative Example 2	84.5	15	0	0	0.5

[0079] Each of the obtained lubricant compositions of Examples and Comparative Examples was fed to a vessel for dipping a chain and kept therein at 150° C. for 1000 hours. As a result, blackening was not observed in the lubricant compositions of the Examples. On the other hand, in the lubricant compositions of the Comparative Examples, blackening was observed within 100 hours.

[0080] Next, the chain 11 as shown in FIGS. 1 and 2 was dipped in each of the lubricant compositions of the Examples and Comparative Examples. After an elapse of 10 minutes, the chain 11 was taken out from the vessel. The chains 11 applied with the lubricant compositions of the Examples exhibited good appearance with no blackening. The chains 11 applied with the lubricant compositions of the Comparative Examples exhibited poor appearance with obvious blackening.

DESCRIPTION OF REFERENCE CHARACTERS

[0081] 11 . . . chain, 21 . . . inner link, 22, 23 . . . inner plate, 22a, 22b, 23a, 23b . . . through-hole, 24, 25 . . . bushing, 26, 27 . . . roller, 31 . . . outer link, 32, 33 . . . outer plate, 34, 35 . . . pin

1. A lubricant composition for a chain comprising a base oil, a thickener, and an anticorrosive agent,

wherein the lubricant composition has a sulfur content of not more than 100 ppm by mass, a phosphorus content of not more than 1 mass %, and an aromatic content of not more than 1 mass %.

2. The lubricant composition according to claim 1 further comprising an oily agent, wherein the oily agent comprises a compound having a sulfur content of not more than 100 ppm by mass, a phosphorus content of not more than 1 mass %, and an aromatic content of not more than 1 mass %.

3. The lubricant composition according to claim 2, wherein the oily agent comprises at least one selected from a fatty acid ester and a lanolin fatty acid alcohol ester.

4. The lubricant composition according to claim 1 for use in a vessel for dipping a chain.

5. A chain applied with the lubricant composition according to claim 1.

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