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QUENCH OIL COMPOSITION AND METHOD OF USE

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ABSTRACT OF THE DISCLOSURE

An improved quenching oil composition comprised of a major portion of a petroleum oil having a viscosity within the range of about 40 to about 300 SUS (Saybolt Universal Seconds) at 100° F. and a flash point in excess of 250° F. and about 2% to about 15% by weight of a quench oil additive, which is an oil soluble petroleum resin produced from distillates of cracked petroleum stock having a melting point of at least 40° C. and an aniline point value of less than 50° C. (ASTM-D-6611-64). The composition disclosed herein has led to unexpectedly good quenching oil properties and in particular the disclosed quench oil composition has unexpectedly superior high temperature stability when used for prolonged periods in quench oil baths.

This application is a continuation of application Ser. No. 701,112 filed Jan. 29, 1968 and now abandoned.

BACKGROUND OF THE INVENTION

This invention broadly relates to improved compositions which are suitable for use as quenching oils, to a method of using the composition, and to a concentrate form of the composition which concentrate is suitable for addition to quenching oils.

The state of prior art references related to the invention as known by applicant pursuant to a preliminary search is indicated by the references identified below.

U.S. Pats. 1,818,431, 2,031,431, 2,327,383, 2,327,976, 2,327,977, 2,340,724, 2,483,725, 2,600,290, 2,799,606, 2,848,362, 2,857,301, 2,866,729, 2,910,395, 3,022,205, 3,027,315, 3,072,506, 3,205,100.

Various quenching oil compositions are well known in the art as indicated by the above group of prior art patents. To a certain limited extent, conventional oils which do not contain a quench oil accelerator additive tend to become better quenchants as they are used and this is generally considered due to partial oxidation and polymerization which takes place within the conventional oil. However it is desirable in the art to use an oil which has an accelerated quench time through the use of an additive, but even when an accelerated oil is used as a quenching composition the accelerated oil degrades or tends to become slower during usage. The accelerated quench oil composition also experiences the same oxidation and polymerization as a conventional oil and, degradation of the accelerators has a noticeable effect on the quenching rate of an accelerated quench oil composition. Degradation of accelerated oils is brought about by what may be termed "normal breakdown." The accelerator additives in a fast-rate quench oil are preferentially decomposed instead of the base oil probably due to the fact that the accelerators are attracted to the hot metal while performing their wetting action and are therefore in more intimate contact with the hot metal than is the base oil. Accelerated oils are also broken down by prolonged heating at temperatures in the approximate area of 300° F. Thus in the past accelerated oils have lost their fast quenching ability due to degradation caused by heating (300° F.) and by the preferential decomposition of the accelerator additive during the quenching process.

Accordingly, it is an object of this invention to provide an improved quench oil composition and method of using the same.

Another object of this invention is to provide an improved quench oil composition which exhibits unexpectedly good resistance to degradation or deterioration during usage, and which composition exhibits excellent high temperature stability.

Still further it is an object of this invention to provide an improved quench oil composition possessing high hot wire stability after prolonged usage, and which composition possesses only a minimal amount of naphtha insolubles after prolonged usage as indicated by a high temperature stability test described hereinafter.

Still another object of the invention is to provide an improved concentrate form of the quench oil composition herein which can be added to a suitable petroleum base oil to form an accelerated quench oil composition.

Other objects, features and advantages of the present invention will become apparent from the subsequent description and the appended claims.

SUMMARY OF THE INVENTION

Briefly stated, the present invention comprises a composition suitable for use as a quenching oil composition comprised of: (a) a major portion of petroleum oil, having a viscosity within the range of about 40 to about 300 SUS at 100° F., and a flash point in excess of 250° F., and (b) about 2% to about 15% by weight of an additive comprising an oil soluble, petroleum resin produced by the homo- and copolymerization of dienes and olefins of aliphatic, alicyclic, and monobenzenoid types from distillates of cracked petroleum stocks, said resin having a melting point greater than 40° C., a specific gravity greater than 0.9, and an aniline point value of less than 50° C., said composition having naphtha insolubles not in excess of 1% by volume after 120 hours heating at 300° F.; and, the method of using said composition.

In another aspect, briefly stated, the present invention comprises a liquid concentrate composition suitable for addition to a quenching oil to improve the quenching properties thereof, said composition comprising: (a) a major portion of a liquid carrier oil, having a viscosity within the range of about 40 to about 300 SUS at 100° F., and a flash point in excess of 250° F., and (b) greater than 15% up to about 50% by weight of a quench oil additive comprising an oil soluble, petroleum resin produced by the homo- and co-polymerization of dienes and olefins of aliphatic, alicyclic, and monobenzenoid types from distillates of cracked petroleum stocks, said resin having a melting point greater than 40° C. a specific gravity greater than 0.9, and an aniline point value of less than 50° C.

In its method aspect, briefly stated, the present invention comprises a method of quenching heated metal comprising immersing the metals in a liquid quenching composition comprised of: (a) a major portion of a petroleum oil, having a viscosity within the range of about 40 to about 300 SUS at 100° F., and a flash point in excess of 250°, and (b) about 2% to about 15% by weight of a quench oil additive comprising an oil soluble, petroleum resin produced by the homo- and co-polymerization of dienes and olefins of aliphatic, alicyclic, and monobenzenoid types from distillates of cracked petroleum stocks, said resin having a melting point greater than 40° C., a specific gravity greater than 0.9, and an aniline point value of less than 50° C.

DESCRIPTION OF PREFERRED EMBODIMENTS

The base oil used to form the quench oil should have a relatively high flash point, relatively low viscosity, be stable at high temperatures, have good hot metal wetting properties, and accept and respond to accelerator additives. Broadly, the base oil is a petroleum oil and more specifically stated the base oil should be a mineral oil such as a paraffinic base oil.

The viscosity of the base oil broadly stated should be within the range of about 40 to about 300 SUS at 100° F.; and, preferably the viscosity of the base oil should be within the range of about 70 to about 100 SUS at 100° F.

The flash point of the base oil broadly stated should be greater than 250° F. Cleveland Open Cup (COC) Test Method; and, preferably the flash point of the base oil should be greater than 320° F., COC.

A number of different base oils can be used to form the quench oil composition of this invention and the particular selection of the base oil is not critical so long as the above criteria are met.

The quench oil additive or accelerator which has been discovered and disclosed herein has been found to give an unexpectedly and unique quench oil composition.

The additive broadly stated is an oil soluble, petroleum resin produced by the homo- and co-polyemrization of dienes and olefins of aliphatic, alicyclic, and monobenzenoid types from distillates of cracked petroleum stocks.

The melting point of the resin additive broadly stated should be greater than 40° C.; and, preferably the melting should be within the range of about 90 to about 120° C.; and the best results using the invention have been obtained when the resin melting point is approximately 100° C.

The resin additive specific gravity broadly stated should be greater than about 0.9; and, preferably the specific gravity should be within the range of about 0.9 to about 1.3; and the best results have been obtained with a specific gravity of approximately 1.

The aniline point value (ASTM–D–611–64 test procedure) is also considered an important determination in describing the resin to be used and in describing the resins intended to be included within the scope of the invention. The aniline point value should be less than 50° C. for the resin additive.

The flash point of the resin additive on a preferred basis should be approximately 480° F., COC.

The amount of resin additive used in the quench oil composition broadly stated should be within the range of about 2 to about 15% by weight; and, preferably within the range of about 3 to about 8% by weight.

TABLE 1

A typically suitable resin for use in the quench oil composition would have the following properties:

Color, coal tar, max.—1⅛
Melting point—100° C.
Specific gravity—1.06
Bromine number elec.—10.3
Iodine number (corrected)—16.4
Refractive index, 25° C.—1.60
COC flash point, degrees F.—480° F.
Acid number, max.—1.0
Saponification number, max.—1.0
Aniline point value—about 0° C.

A liquid concentrate form of the quench oil composition disclosed herein is also contemplated within the scope of the invention.

The amount of resin additive used to form the liquid concentrate composition should be within the range of greater than 15% by weight of the composition up to about 42% by weight. The base oil used for the concentrated composition should generally meet the same criteria outlined above for the base oil.

Tests have shown that the quench oil composition which has been discovered is an unexpectedly good quench oil composition.

The hot wire test: This test is a means of evaluating the quench oil. It involves applying an electrical current to a short piece of Nichrome wire immersed in 100–150 ml. of the quench oil being tested. The oil itself is maintained at a temperature of 130–140° F. during the test. The wire is held between two brass electrodes and the current is applied to the wire by turning a rheostat, and then the amperage is read off an ammeter at the point when the wire burns in half. Higher hot wire readings (amperes) indicate better heat extraction qualities and thus better quench oils.

The nickel ball test: This test is described in U.S. Pat. No. 3,205,100, and the test is also fully described in a brochure published by General Motors Corporation in October 1957 entitled "Process Developments-Magnetic Quench Test." Pure nickel is magnetic at temperatures below a Curie point of 670° F. and nonmagnetic above 670° F. This is the basis for the nickel ball test, in which a ball approximately ⅞ inch in diameter, is heated to a predetermined temperature and then quenched into the quench oil composition being tested. A timing device is started as soon as the ball is dropped into a pivoted basket assembly, and stopped when the ball swings over to a powerful magnet along side the beaker indicating that the temperature has passed below 670° F. The faster the quench oil the shorter the time period elapsed will be. A chromized nickel ball was used in the testing of the quench oil composition of this invention in an oil bath without agitation, and with the oil temperature being approximately room temperature.

Th naphtha insolubles test: In this test 10 ml. of the thoroughly stirred quench oil composition being tested is transferred into a 15 ml. conical centifuge tube, and 5 ml. of naphtha is added to the tube. The sample is well shaken and centifuged ten minutes. The insolubles content in the naphtha is recorded as naphtha insolubles. The report of the test is given as volume percent naphtha insolubles at the bottom of the tube.

The high temperature stability test: In this test a No. 3600 Labline oven was used. The oven is noncirculating and has three inch insulated walls with a useable working area of 13 x 13 x 13 inches. The oven was thermostatically controlled. One hundred grams of the quench oil composition being tested is weighed into a 250 ml. Pyrex beaker. All samples tested are placed on the same shelf and the same distance from the oven walls. The test duration can be either five days or seven days (depending upon the degree of breakdown sought or anticipated in the test), and after the test the oil is removed and allowed to cool to room temperature. To determine the stability of the oil after the test, the oil is thoroughly stirred and quickly transferred into another 250 ml. beaker. The oil from this beaker is then used for a determination of the naphtha insolubles using the above described naphtha insolubles test in order to determine generally the amount of degradation and deterioration of the quench oil composition which had taken place as indicated by the residue, insolubles, etc., which comes out in the test.

The following test results indicate the unexpectedly good properties of the quench oil composition herein.

TABLE 2.—TEST RESULTS

	Hot wire test result before oven test (amperes)	Hot wire test result after oven test, 148 hrs. at 300 °F (amperes)	Naphtha insolubles test result after 148 hrs. at. 300° F percent vol)
(1) Paraffin oil (70 SUS at 100° F.) standard for comparison w/o additive	23	24	0.6
(2) Sinclair-510 Quench oil	32	31	4.0
(3) Shell Voluta 23 Quench oil	30.5	30	2.5
(4) Paraffin oil (70 SUS) including 4.2 wt. percent resin additive of Table 1 above	33.5	34.5	0.6

TABLE 3.—NICKEL BALL TEST RESULTS

	Quenching speed in seconds of oil composition
(1) Paraffin oil (70 SUS at 100° F.)	27
(2) Paraffin oil (70 SUS) including 4.2 wt. percent resin additive of Table 1 above	16

In order to further illustrate the invention, the following examples are provided. It is to be understood, however, that the examples are included for illustrative purposes and are not intended to be limiting of the scope of the invention as set forth in the subjoined claims.

EXAMPLE 1

	Percent wt.
70 SUS paraffin oil	95.8
Resin of Table 1	4.2

EXAMPLES 2

	Hot wire test (amperes)
(2a) 70 SUS paraffin oil (Fleet-wing Corp.) including 4% wt. wt. resin of Table 1	33.5
(2b) 70 SUS paraffin oil (Fleet-wing Corp.) including 6% wt. resin of Table 1	36.0
(2c) 70 SUS paraffin oil (Fleet-wing Corp.) including 10% wt. resin of Table 1	33.0

EXAMPLE 3

	Hot wire test (amperes)
(3a) 70 SUS paraffin (Texaco) including 4% wt. resin of Table 1	33.0
(3b) 70 SUS paraffin (Texaco) including 6% wt. resin of Table 1	35.5
(3c) 70 SUS paraffin (Texaco) including 10% wt. resin of Table 1	35.5

While it will be apparent that the preferred embodiments of the invention disclosed are well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the proper scope or fair meaning of the subjoined claims.

What is claimed is:

1. A composition suitable for use as a quenching oil composition comprised of:

(a) a major portion of substantially paraffinic base petroleum oil, having a viscosity within the range of about 40 to about 300 SUS at 100° F., and a flash point in excess of 250° F., and

(b) about 2% to about 15% by weight of an oil soluble, petroleum resin quench oil additive produced during or subsequent to cracking of a petroleum fraction and being obtained by

the homo- and co-polymerization of aliphatic, alicyclic, and mono-benzenoid olefins and dienes contained in distillates of cracked petroleum stocks,

said resin having a melting point greater than 40° C., a specific gravity greater than 0.9, and an aniline point value of less than 50° C.,

said composition having naphtha insolubles not in excess of 1% by volume after 120 hours heating at 300° F.

2. The composition of claim **1** wherein

said resin melting point is from about 40° to about 120° C.

3. The composition of claim **2** wherein

said resin specific gravity is from about 0.9 to about 1.3.

4. The composition of claim **3** wherein

said resin melting point is from about 90° to about 120° C.

5. The composition of claim **4** wherein

said resin has

a flash point of about 480° F.,

a specific gravity of about 1, and

a melting point of about 100° C.

6. The composition of claim **1** wherein

said oil viscosity is from about 70 to about 100 SUS at 100° F.

7. The composition of claim **6** wherein

said oil flash point is in excess of 320° F.

8. The composition of claim **7** wherein

said resin melting point is from about 90° to about 120° C.

9. The composition of claim **8** wherein

said resin is present from about 3% to about 8% by weight.

10. The composition of claim **9** wherein

said resin specific gravity is from about 0.9 to about 1.3.

11. The composition of claim **10** wherein

said resin has

a flash point of about 480° F.,

a specific gravity of about 1, and

a melting point of about 100° C.

12. A liquid concentrate composition suitable for addition to a quenching oil to improve the quenching properties thereof,

said composition comprising:

(a) a major portion of a liquid substantially paraffinic base carrier oil, having a viscosity within the range of about 40 to about 300 SUS at 100° F., and a flash point in excess of 250° F., and

(b) greater than 15% up to about 50% by weight of an oil soluble, petroleum resin quench oil additive produced during or subsequent to cracking of a petroleum fraction and being obtained by

the homo- and co-polymerization of aliphatic, alicyclic, and mono-benzenoid olefins and dienes contained in distillates of cracked petroleum stocks,

said resin having a melting point greater than 40° C., a specific gravity greater than 0.9, and an aniline point value of less than 50° C.

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252—73; 148—18, 29