SUMMARY OF INVENTION

According to a first aspect of the invention, there is provided a trunk piston engine lubricating composition (or a lubricant composition) comprising a base oil of lubricating viscosity and an additive composition comprising an anti-wear additive comprising a zinc dialkyl dithiophosphate (ZDDP) and a detergent composition comprising one or more detergents. In one embodiment, the ZDDP comprises at least one ester moiety derived from a primary alcohol.

In one embodiment, the additive composition is present in the lubricating composition in a 40 Base Number (BN) equivalent amount of up to 15% w/w of the lubricating composition (or is provided at a 40 BN equivalent treat rate of up to 15% w/w of the lubricating composition).

In one aspect, there is provided a trunk piston engine lubricating composition comprising a base oil of lubricating viscosity; and an additive composition comprising an anti-wear additive comprising a zinc dialkyl dithiophosphate (ZDDP) and a detergent composition comprising one or more detergents, wherein the ZDDP comprises at least one ester moiety derived from a primary alcohol and wherein the additive composition is present in a 40 Base Number equivalent amount of up to 15% w/w of the lubricating composition.

In one embodiment, the detergent composition is present in the lubricating composition in a 40 BN equivalent amount of up to 14.5% w/w of the lubricating composition (or is provided at a 40 BN equivalent treat rate of up to 14.5% w/w of the lubricating composition). In one embodiment, the ZDDP comprises at least one ester moiety derived from a primary alcohol and preferably the additive composition is present in the lubricating composition in a 40 BN equivalent amount of up to 15% w/w of the lubricating composition.

In a second aspect of the invention, there is provided a use of a zinc dialkyl dithiophosphate (ZDDP) to enhance or improve asphaltene handling in a trunk piston engine lubricating composition (or in a lubricant composition), wherein the ZDDP preferably comprises at least one ester moiety derived from a primary alcohol.

In a third aspect of the invention, there is provided a use of a zinc dialkyl dithiophosphate (ZDDP) preferably comprising at least one ester moiety derived from a primary alcohol to enable reduced detergent treat rate in a trunk piston engine lubricating composition (or in a lubricant composition).

In a fourth aspect of the invention, there is provided a use of an additive pack or additive composition to enhance asphaltene handling in a trunk piston engine lubricating composition (or lubricant composition), the additive pack comprising an anti-wear additive comprising a zinc dialkyl dithiophosphate (ZDDP) comprising at least one ester moiety

derived from a primary alcohol and a detergent composition comprising one or more detergents.

In one embodiment, the use is effected by adding the additive pack to a base oil at a 40 BN equivalent treat rate of up to 15% w/w of a resulting lubricating composition.

In a fifth aspect of the invention, there is provided a use of detergent composition in a TPEO detergency amount to improve the asphaltene handling of a trunk piston engine lubricating composition by providing the detergent composition in combination with a zinc dialkyl dithiophosphate (ZDDP) comprising at least one ester moiety derived from a primary alcohol.

In another aspect, there is provided a use of detergent composition for a trunk piston engine lubricating composition in combination with a zinc dialkyl dithiophosphate (ZDDP) comprising at least one ester moiety derived from a primary alcohol for enhancing asphaltene handling in said lubricating composition. In one embodiment, the use is effected by adding the detergent composition with the ZDDP to a base oil for a trunk piston engine lubricating composition at a 40 BN treat rate equivalent of up to 14.5% w/w of the resulting lubricating composition.

In a sixth aspect of the invention, there is provided a base oil for use in a trunk piston engine lubricating composition with an additive composition, the base oil comprising in all or in a major part of a primary Group I base stock with a sulfur content of at least 6000 ppm and an aromatic component content of at least 5% by weight and/or the primary Group I base stock having a kinematic viscosity at 100°C of from 12.5 to 17.

In a seventh aspect of the invention, there is provided use of a base oil as defined above to enhance asphaltene handling in a trunk piston engine lubricating composition comprising the base oil and a lubricating composition with an additive composition.

In an eighth aspect of the invention, there is provided a method for the manufacture of a trunk piston engine lubricating composition, the method comprising combining a base oil with an additive composition comprising an anti-wear additive comprising a zinc dialkyl dithiophosphate (ZDDP) comprising at least one ester moiety derived from a primary alcohol and a detergent composition comprising one or more detergents.

In an ninth aspect of the invention, there is provided a method of operating a trunk piston marine engine comprising fuelling the engine with a heavy fuel oil and lubricating the crankcase of the engine with a lubricating composition as defined above.

DETAILED DESCRIPTION

The invention, according to a first aspect is directed to a trunk piston engine (preferably trunk piston marine engine) lubricating composition (or to a lubricant