Included here are olefin copolymers, polyisobutene, styrene-maleic anhydride copolymers, polyisoprene, and polyalkyl acrylates and methacrylates. When PAGs are used as base oil, conventional VIIs cannot be used in general, owing to their low solubility.

Polymers with repeating units which comprise polyalkylene glycol groups are known from the prior art. However, these polymers comprise relatively small fractions of these repeating units.

For example, the documents US 2,892,820 and US 3,277,157 describe PAMA soluble in mineral oil and having side chains based on polyethylene glycol. Through the use of PAMA with polyalkylene glycol side chains, the modified polymers exhibit detergency and dispersing properties, these properties being determinable through reduced paintlike adhesions to cylinders. Similar properties of such polymers are set out in publications EP 418 610 A1 and EP 542 111 A2. Moreover, demulsifiers based on polyalkyl (meth)acrylate copolymers are known from DE 198 03 696 A1.

The use of polyalkyl (meth)acrylate copolymers with polyalkylene glycol side groups for improving the viscosity index of lubricating oil compositions which comprise at least one polar base oil is not described in the publications set out above.

In light of the prior art, then, it was an object of the ~~present invention~~embodiments disclosed herein to provide an additive which leads to an improvement in viscosity index for lubricating oil compositions which comprise at least one polar base oil. This improvement ought to be achieved more particularly for

lubricating oil compositions which comprise at least one polyalkylene glycol.

Furthermore, therefore, it was an object of the ~~present invention~~embodiments disclosed herein to provide an additive which leads with very high efficiency to an improvement in the viscosity index. Accordingly, a very small addition of additive ought to be necessary in order to bring about thickening of the polar base oil to a level in line with the standard. In this context, the drop in viscosity on increasing oil temperature ought to be able to be reduced perceptibly even with very small amounts of additive.

A further object of the ~~present invention~~embodiments disclosed herein was to provide an additive which exhibits a good dispersing quality. The additive ought further to exhibit high compatibility with rubber and elastomers (gasket compatibility), so that these components are not attacked by the additive. Similarly, the additive ought not adversely to affect the further desirable properties of the lubricating oil. Thus the additive should not adversely affect the high affinity for metal surfaces of the polar base oil, so that the lubricating film remains intact even under high loads.

Another object of the ~~invention~~embodiments disclosed herein was to provide additives which can be prepared easily and inexpensively, and, in particular, commercially available components ought to be used. The production process here is to be able to be carried out industrially, without the need for new plants or plants of complex structure for that purpose.

An objective of the ~~present invention~~embodiments disclosed herein, moreover, was to provide an additive which brings about a multiplicity of

desirable properties in the lubricating oil composition. This allows the number of different additives to be minimized. Accordingly, preferred additives ought more particularly to exhibit dispersing effects.

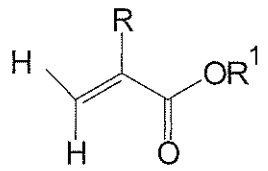
Furthermore, the additive should not exhibit any adverse effects on the environmental compatibility of the base oil.

Furthermore, the additives ought to have particularly long keeping qualities and ought not to exhibit great degradation during use, thus allowing lubricating oil compositions modified accordingly to be used over a long period of time.

These objects and also others which, though not stated explicitly, are nevertheless readily inferable or realizable from the introductory discussion herein are achieved by means of (meth)acrylate polymers for improving the viscosity index that have all of the features of claim 1. Judicious modifications of the (meth)acrylate polymers of the ~~invention~~disclosure are protected in the dependent subclaims. With regard to the lubricating oil compositions, the particular use of (meth)acrylate polymers of the ~~invention~~disclosure, and preferred processes for preparing them, claims 9, 12, and 14 provide the achievement of the relevant objects.

In a first aspect, t~~T~~he present ~~invention~~disclosure accordingly provides a (meth)acrylate polymer for improving the viscosity index, ~~which is~~ characterized in that the (meth)acrylate polymer

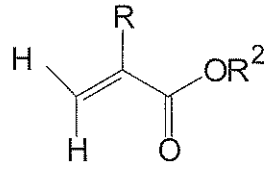
a) comprises 5% to 60% by weight of repeating units derived from (meth)acrylates of the formula (I)



(I),

in which R represents hydrogen or methyl and R^1 denotes an alkyl radical having 1 to 6 carbon atoms,

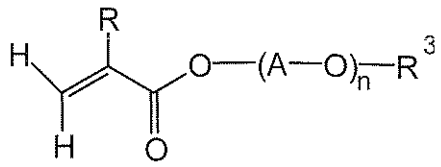
b) comprises 5% to 80% by weight of repeating units derived from (meth)acrylates of the formula (II)



(II),

in which R represents hydrogen or methyl and R^2 denotes an alkyl radical having 7 to 30 carbon atoms, and

c) comprises 15% to 90% by weight of repeating units derived from (meth)acrylates of the formula (III)



(III),

in which R represents hydrogen or methyl, n stands for a number in the range from 2 to 500 and A stands for C_2-C_4 alkylene, and R^3 denotes a hydrogen atom or an alkyl radical having 1 to 4 carbon atoms, and wherein the (meth)acrylate polymer is a statistical polymer.

In a second aspect, the present disclosure accordingly provides a lubricating oil composition comprising at least one polar base oil and at least one (meth)acrylate polymer as defined above.

In a third aspect, the present disclosure accordingly provides a process for preparing (meth)acrylate polymer as defined above, characterized in that a mixture comprising (meth)acrylates of the formulae (I), (II), and (III) is radically polymerized.

By this means it is possible in an unforeseeable way to provide an additive which leads with a very high efficiency to an improvement in the viscosity index. Accordingly, a relatively small addition of additive leads to a thickening of the polar base oil to a level in line with the standard. In this context, the drop in viscosity with increasing oil temperature can be lessened perceptibly even with very small amounts of additive.