For cleaning off a lubricant based on a saturated aliphatic monohydric C_{14-18} alcohol that is formed as film on the surface of the workpiece for cold machining of aluminum, WO 91/06619 describes heating of the workpiece so that the lubricant evaporates.

Based on this prior art, it is object of the present invention to provide a minimum quantity lubricant that, without heating, can be cleaned off not only from the workpiece but also from the tool and the machine tool in a simple way.

This object is solved by a lubricant composition with the features of claim 1.

Further embodiments of the lubricant composition are disclosed in the dependent claims.

The simple cleaning off when using the lubricant composition is disclosed by the features of independent claim 8.

The lubricant composition according to the invention for minimum quantity lubrication for metalworking is comprised of a main proportion of an aliphatic C_{16-24} alcohol to which is added a minimal proportion of an emulsifier so that the lubricant can be emulsified with water. In this way, not only the workpiece but also the tool and the machining space (e.g., interior of the machine) can be simply freed from the residues of the lubricant composition according to the invention by emulsifying with water. However, care must be taken that the lubricant composition during storage and supply to the tool does not come into contact with water.

A preferred emulsifier can be a fatty alcohol polyalkylene glycol ether which is contained in the composition with 0.05 to 5 wt.% relative to the total weight of the composition. Alternatively, the emulsifier can be a glycolic acid alkoxylate alkyl ether whose proportion in the composition lies in a range of 0.05 to 5 wt.% relative to the total weight of the composition. However, it is also

conceivable that mixtures of fatty alcohol polyalkylene glycol ether and glycolic acid alkoxylate alkyl ether are used as emulsifier with a weight proportion of 0.05 to 5 wt.% relative to the total weight of the composition. The aliphatic C_{16-24} alcohol is then present in a proportion that supplements the composition to 100%, respectively.

The fatty alcohol polyalkylene glycol ether has the formula (I)

$$R^*\text{-}[(CH_2CH_2O)_x\text{-}(CH_2CH(CH_3)O)_y]\text{-}R^1 \quad (I)$$

wherein R^1 is an aliphatic, branched or linear C_{16-18} alkyl or alkylene residue. R* can be a hydroxyl group. The variables x and y can be 0 to 10 with the condition that the sum of x + y is from 1 to 10. The fatty alcohol polyalkylene glycol ether, also by trivial name fatty alcohol alkoxylate or alkoxylated fatty alcohol, can be comprised only of ethylene oxide units (y = 0) or only of propylene oxide units (x = 0). The polyalkylene glycol ether may however also contain ethylene oxide units as well as propylene oxide units. In this context, the respective proportions as well as sequence of the units (e.g., alternating or in blocks) can vary. A non-limiting exemplary purely ethoxylated fatty alcohol can be based on oleyl or cetyl alcohol: $HO\text{-}(CH_2CH_2O)_n\text{-}R$ with R = C_{18} or C_{16} with n = 5, for example. Deviations with regard to the base alcohol, type and number of alkoxy units are conceivable, of course.

Preferably, the weight proportion of the fatty alcohol polyalkylene glycol ether can amount to 1 to 5 wt.%, wherein smaller proportions, e.g., 1 wt.%, are preferred in particular. Advantageously, the lubricant composition with 1 wt.% fatty alcohol polyalkylene glycol ether exhibits a suitable emulsifier balance with sufficiently good emulsifying properties without negatively affecting the separation behavior in the cleaning device (demulsifying behavior) in this context. While an emulsifier concentration that is too low causes a reduced cleaning action on tool, workpiece, and machine space, concentrations that are too high prevent the oil separation in the cleaning device.

The glycolic acid alkoxylate alkyl ether (also ether carboxylic acid) as an alternative to the fatty alcohol polyalkylene glycol ether has the formula (II)

$$R^2\text{-}O\text{-}[(CH_2CH_2O)_x\text{-}(CH_2CH(CH_3)O)_y]\text{-}CH_2\text{-}COOH \quad (II)$$

wherein R^2 is an aliphatic, preferably branched or linear, $C_{6\text{-}20}$ alkyl or alkylene residue. In this context, purely ethoxylated, purely propoxylated, or mixed ethoxylated and propoxylated compounds are also conceivable so that x and y can be selected from 0 to 10 with the condition that the sum x + y = 1 to 10. The glycolic acid alkoxylate alkyl ether is preferably a glycolic acid ethoxylate alkyl ether.

Examples of glycolic acid alkoxylate alkyl ether are poly(oxy-1,2-ethanediyl), α-(carboxymethyl)-ω-hydroxy-, $C_{10\text{-}16}$ and $C_{12\text{-}20}$ unsaturated alkyl ethers (e.g., CAS No. 68954-89-2), poly(oxy-1,2-ethanediyl), α-(carboxymethyl)-ω-hydroxy-, $C_{16\text{-}18}$ and C_{18} unsaturated alkyl ethers (CAS No. 227310-69-2), poly(oxy-1,2-ethanediyl), α-(carboxymethyl)-ω- octyloxy-, (CAS No. 53563-70-5) or poly(oxy-1,2-ethanediyl), α-(carboxymethyl)-ω- hexyloxy-, (CAS No. 105391-15-9).

The aliphatic $C_{16\text{-}24}$ alcohol which is used in the lubricant composition according to the invention can be a branched alcohol, preferably a Guerbet alcohol (long-chain alcohol that is alkyl-substituted in α position relative to the primary OH residue), such as e.g. 2-hexyl-1-decanol or 2-octyl-1-dodecanol. The latter C_{20} alcohol can be employed preferably. Due to the low pour point and the reduced adhesion tendency as a result of complete saturation, such alcohols can be used at lower temperatures of use compared to natural linear alcohols.

A lubricant composition embodied according to the invention can thus be comprised of only two components, the basic $C_{16\text{-}24}$ alcohol and the emulsifier.

In a further embodiment of the invention, it can however be provided also that the lubricant composition contains in addition from 0.05 to 5 wt.%, relative to the total weight of the composition, fatty acid alkanolamide or alkoxylated fatty