[0052] Preferred examples of the alkali-soluble group include a carboxyl group, a fluorinated alcohol group (preferably a hexafluoroisopropanol group), and a sulfonic acid group.

[0053] The group which is preferable as the acid-decomposable group is a group in which a hydrogen atom of the alkali-soluble group is substituted with a group capable of leaving by an acid.

[0054] Examples of the group capable of leaving by an acid include $-C(R_{36})(R_{37})(R_{38})$, $-C(R_{36})(R_{37})(OR_{39})$, and $-C(R_{01})(R_{02})(OR_{39})$.

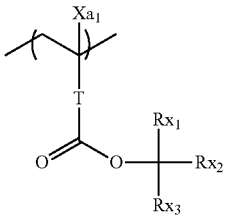
[0055] In the formulae, R_{36} to R_{39} each independently represent an alkyl group, a cycloalkyl group, an aryl group, an aralkyl group, or an alkenyl group. R_{36} and R_{37} may be bonded to each other to form a ring.

[0056] R_{01} to R_{02} each independently represent a hydrogen atom, an alkyl group, a cycloalkyl group, an aryl group, an aralkyl group, or an alkenyl group.

[0057] The acid-decomposable group is preferably a cumyl ester group, an enol ester group, an acetal ester group, a tertiary alkyl ester group, or the like, and more preferably a tertiary alkyl ester group.

[0058] Furthermore, a repeating unit represented by the following General Formula (AI) is preferable as the repeating unit having an acid-decomposable group, which can be contained in the resin (A).

(A I)



[0059] In General Formula (AI),

[0060] Xa_1 represents a hydrogen atom, or an alkyl group which may have a substituent,

[0061] T represents a single bond or a divalent linking group,

[0062] Rx_1 to Rx_3 each independently represent an (linear or branched) alkyl group or a (monocyclic or polycyclic) cycloalkyl group, and

[0063] two members out of Rx_1 to Rx_3 may be bonded to each other to form a (monocyclic or polycyclic) cycloalkyl group.

[0064] Examples of the alkyl group which may have a substituent, represented by Xa_1, include a methyl group or a group represented by $-CH_2-R_{11}$. R_{11} represents a halogen atom (a fluorine atom or the like), a hydroxyl group, or a monovalent organic group, and examples thereof include an alkyl group having 5 or less carbon atoms, and an acyl group having 5 or less carbon atoms, preferably an alkyl group having 3 or less carbon atoms, and more preferably a methyl group. In one aspect, Xa_1 is preferably a hydrogen atom, a methyl group, a trifluoromethyl group, a hydroxymethyl group, or the like.

[0065] Examples of the divalent linking group of T include an alkylene group, a —COO-Rt- group, and an —ORt- group. In the formulae, Rt represents an alkylene group or a cycloalkylene group.

[0066] T is preferably a single bond or a —COO-Rt- group. Rt is preferably an alkylene group having 1 to 5 carbon atoms, and more preferably a $-CH_2-$ group, a $-(CH_2)_2-$ group, or a $-(CH_2)_3-$ group.

[0067] As the alkyl group of Rx_1 to Rx_3, an alkyl group having 1 to 4 carbon atoms, such as a methyl group, an ethyl group, an n-propyl group, an isopropyl group, an n-butyl group, an isobutyl group, and a t-butyl group is preferable.

[0068] As the cycloalkyl group of Rx_1 to Rx_3, a monocyclic cycloalkyl group such as a cyclopentyl group and a cyclohexyl group, and a polycyclic cycloalkyl group such as a norbornyl group, a tetracyclodecanyl group, a tetracyclododecanyl group, and an adamantyl group are preferable.

[0069] As the cycloalkyl group formed by the mutual bonding of two members of Rx_1 to Rx_3, a monocyclic cycloalkyl group such as a cyclopentyl group and a cyclohexyl group, and a polycyclic cycloalkyl group such as a norbornyl group, a tetracyclodecanyl group, a tetracyclododecanyl group, and an adamantyl group are preferable, and a monocyclic cycloalkyl group having 5 or 6 carbon atoms is particularly preferable.

[0070] In the cycloalkyl group formed by the mutual bonding of two members of Rx_1 to Rx_3, for example, one of the methylene groups constituting the ring may be substituted with a hetero atom such as an oxygen atom, or with a group having a hetero atom, such as a carbonyl group.

[0071] An aspect of the repeating unit represented by General Formula (AI), for example, in which Rx_1 is a methyl group or an ethyl group, and Rx_2 and Rx_3 are bonded to each other to form the afore-mentioned cycloalkyl group, is preferable.

[0072] Each of the groups may have a substituent, and examples of the substituent include an alkyl group (having 1 to 4 carbon atoms), a halogen atom, a hydroxyl group, an alkoxy group (having 1 to 4 carbon atoms), a carboxyl group, and an alkoxycarbonyl group (having 2 to 6 carbon atoms), with those having 8 or less carbon atoms being preferable.

[0073] The total content of the repeating unit having an acid-decomposable group is preferably 20% by mole to 90% by mole, more preferably 25% by mole to 85% by mole, and still more preferably 30% by mole to 80% by mole, with respect to all the repeating units in the resin (A).

[0074] Specific preferred examples of the repeating unit having an acid-decomposable group are set forth below, but the present invention is not limited thereto.

[0075] In the specific examples, Rx and Xa_1 each represent a hydrogen atom, CH_3, CF_3, or CH_2OH. Rxa and Rxb each represent a an alkyl group having 1 to 4 carbon atoms. Z represents a substituent containing a polar group, and in the case where Z's are present in plural numbers, they are each independent. p represents 0 or a positive integer. Examples of the substituent containing a polar group, represented by Z, include a linear or branched alkyl group, and a cycloalkyl group, each having a hydroxyl group, a cyano group, an amino group, an alkylamide group, or a sulfonamide group, and preferably an alkyl group having a hydroxyl group. As the branched alkyl group, an isopropyl group is particularly preferable.