7. The process of claim 2, wherein the diether compound has the general structure (I):

$$R^1O - (C\ R^5R^6)_n - CR^3R^4 - (C\ R^7R^8)_m - OR^2 \quad \textbf{(I)}$$

where

R^1 and R^2 are the same or different and are selected from the group consisting of a saturated or unsaturated aliphatic group of from 1 to 20 carbon atoms or an aryl group of from 6 to 20 carbon atoms,

$n + m = 2$ to 4,

R^3, R^4, R^5, R^6, R^7 and R^8 are identical or different and are each a hydrogen atom, a linear, cyclic or branched hydrocarbon group, for example an alkyl group of from 1 to 20 carbon atoms, an alkenyl group of from 2 to 20 carbon atoms, an aryl group of from 6 to 20 carbon atoms, an arylalkyl group of from 7 to 40 carbon atoms, an alkylaryl group of from 7 to 40 carbon atoms or an arylalkenyl

group of from 8 to 40 carbon atoms and may contain one or more hetero atoms like Si, B, Al, O, S, N or P, and/or may contain halogen atoms like F, Cl or Br, and/or the two radicals R^3 and R^4 may form a hydrocarbon ring system, and R^3 and/or R^4 are different from hydrogen.

8. The process of claim 2, wherein the diether compound has the general structure (II):

$$R^1O - CH_2 - CR^3R^4 - CH_2 - OR^2 \quad \textbf{(II)}$$

where

R^1 and R^2 are the same or different and are selected from the group consisting of a saturated or unsaturated aliphatic group of from 1 to 20 carbon atoms, more preferably an alkyl group of from 1 to 10 carbon atoms, even more preferably an alkyl group of from 1 to 4 carbon atoms, ideally a methyl or ethyl group, most ideally a methyl group,

R^3 and R^4 are identical or different and are each a linear, cyclic or branched hydrocarbon group, for example an alkyl group of from 1 to 20 carbon atoms, an alkenyl group of from 2 to 20 carbon atoms, an aryl group of from 6 to 20 carbon atoms, an arylalkyl group of from 7 to 40 carbon atoms, an alkylaryl group of from 7 to 40 carbon atoms or an arylalkenyl group of from 8 to 40 carbon atoms and may contain one or more hetero atoms like Si, B, Al, O, S, N or P, and/or may contain halogen atoms like F, Cl or Br, and/or the two radicals R^3 and R^4 may form a hydrocarbon ring system.

9. The process of claim 2, wherein the diether compound has the general structure (III):

$$R^1O - CH_2 - CR^3R^4 - CH_2 - OR^2 \quad \textbf{(III)}$$

where

R^1 and R^2 are identical and are selected from the group consisting of an alkyl group of from 1 to 10 carbon atoms, even more preferably an alkyl group of from 1 to 4 carbon atoms, ideally a methyl or ethyl group, most ideally a methyl group,

R^3 and R^4 are identical or different and are each a linear, cyclic or branched hydrocarbon group, for example an alkyl group of from 1 to 10 carbon atoms, an alkenyl group of from 2 to 10 carbon atoms, an aryl group of from 6 to 10 carbon atoms, an arylalkyl group of from 7 to 40 carbon atoms, an alkylaryl group of from 7 to 40 carbon atoms or an arylalkenyl group of from 8 to 40 carbon atoms, and/or the two radicals R^3 and R^4 may form a hydrocarbon ring system, which may contain one or more hetero atoms like Si, O, S, N or P.

10. The process of claim 2, wherein the diether compound comprises at least one of 2,2 di-cyclopentyl-1,3-dimethoxypropane; 2,2 di-(cyclopentylmethyl)-1,3-dimethoxypropane; 2,2-di-cylohexyl-1,3-dimethoxypropane; 2,2-di-(cylohexylmethyl)-1,3-dimethoxypropane; 2,2- di-norbornyl-1,3-dimethoxypropane; 2,2-di-phenyl-1,3-dimethoxypropane; 2,2-di-phenylmethyl-1,3-dimethoxypropane; 2,2-di-n-propyl-1,3-dimethoxypropane; 2,2-di-isopropyl-1,3-dimethoxypropane; 2,2-di-n-butyl-1,3-dimethoxypropane; 2,2-di-secbutyl-1,3-dimethoxypropane; 2,2-di-isobutyl-1,3-dimethoxypropane; 2,2-di-n-pentyl-1,3-dimethoxypropane; 2,2-di-(2-pentyl)-1,3-dimethoxypropane; 2,2-di-(3-pentyl)-1,3-dimethoxypropane; 2,2-di-(methylbutyl)-1,3-dimethoxypropane; 2,2-di-(3-methylbut-2-yl)-1,3-dimethoxypropane; 2,2-di-isopentyl-1,3-dimethoxypropane; 2,2-di-n-hexyl-1,3-dimethoxypropane; 2,2-di-2-hexyl-1,3-dimethoxypropane; 2,2-di-3-hexyl-1,3-dimethoxypropane; 2,2-di-(2-methylpentyl)-1,3-dimethoxypropane; 2,2-di-(3-methylpentyl)-1,3-dimethoxypropane; 2,2-di-(4-methylpentyl)-1,3-dimethoxypropane; 2-tertbutyl-1,3-dimethoxypropane; 2-ethyl-2-tertbutyl-1,3-dimethoxypropane; 2-n-propyl-2-tertbutyl-1,3-dimethoxypropane; 2-n-butyl-2-tertbutyl-1,3-dimethoxypropane; 2-isobutyl-2-tertbutyl-1,3-dimethoxypropane; 2-n-pentyl-2-tertbutyl-1,3-dimethoxypropane; 2-isopentyl-2-tertbutyl-1,3-dimethoxypropane; 2-n-hexyl-2-tertbutyl-1,3-dimethoxypropane; 2-ethyl-2-isopropyl-1,3-dimethoxypropane; 2-n-propyl-2-isopropyl-1,3-dimethoxypropane; 2-n-butyl-2-isopropyl-1,3-dimethoxypropane; 2-secbutyl-2-isopropyl-1,3-dimethoxypropane; 2-isobutyl-2-isopropyl-1,3-dimethoxypropane; 2-n-pentyl-2-isopropyl-1,3-dimethoxypropane; 2-(2-pentyl)-2-isopropyl-1,3-dimethoxypropane; 2-(3-pentyl)-2-isopropyl-1,3-dimethoxypropane; 2-methylbutyl-2-isopropyl-1,3-dimethoxypropane; 2-(3-methylbut-2-yl)-2-isopropyl-1,3-dimethoxypropane; 2-isopentyl-2-isopropyl-1,3-dimethoxypropane; 2-n-hexyl-2-isopropyl-1,3-dimethoxypropane; 2-(2-hexyl)-2-

dimethoxypropane; 2-ethyl-2-tert-butyl-1,3-dimethoxypropane or the corresponding 1,3-diethoxypropane analogues or 9,9-bis(methoxymethyl)fluorene or 9,9-bis(ethoxymethyl)fluorene.

13. The process of claim 2, wherein the diether donor compound is used in an amount of from about 0.01 to about 2 mole for each mole of the magnesium halide compound

14. A process for the polymerization of olefins of formula $CH2=CHR^1$, in which R^1 is hydrogen or a hydrocarbon radical having 1-12 carbon atoms carried out in the presence of a catalyst according to claim 1.