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- [54] ENTANGLEMENT-INHIBITED
MACROMOLECULES
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- [58] Field of Search **525/132, 319, 320, 322**

Huang et al., J. Poly. Sci.: Part A: Poly. Chem. Ed., vol. 24, pp. 2853-2866 (1986).
 G. D. Jones et al., "Isobutylene Copolymers of Vinylbenzyl Chloride and Isopropenylbenzyl Chloride," J. Appl. Poly. Sci., vol. V, Issue No. 16, pp. 452-459 (1969).
 Sadykyhov et al., "Chloromethylation of Isobutylenestyrene Copolymers and Some of Its Chemical Reactions," *Acerb. Neft. Khoz.*, 1979 (6) 37-9.
 (List continued on next page.)

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[56] **References Cited**

U.S. PATENT DOCUMENTS

3,145,187	8/1964	Hankey et al. .	
3,235,626	2/1966	Waack .	
3,506,741	4/1970	Trepka .	
3,786,116	1/1974	Milkovich et al. .	
3,862,265	1/1975	Steinkamp et al. .	
3,879,494	4/1975	Milkovich .	
3,948,868	4/1976	Powers .	
3,989,768	11/1976	Milkovich et al. .	
4,074,034	2/1978	Soga et al. .	
4,548,995	10/1985	Kowalski et al. .	
4,585,825	4/1986	Wesselmann	525/71
4,594,391	6/1986	Jones	525/316
4,599,384	7/1986	Farona et al. .	
5,084,522	1/1992	Frechet	525/333.3

FOREIGN PATENT DOCUMENTS

200098	11/1979	Czechoslovakia .
0344021	11/1989	European Pat. Off. .
WO85/05370	12/1985	PCT Int'l Appl. .
WO88/02014	3/1988	PCT Int'l Appl. .

OTHER PUBLICATIONS

Milkovich et al., J. Appl. Sci., vol. 27, pp. 4773-4786 (1982).

[57] **ABSTRACT**

A grafted and/or functionalized macromolecule comprises entanglement-inhibited architecture wherein the polymer exhibits reduced melt viscosity. In one embodiment, the macromolecule comprises a polymer of an isoolefin having about 4 to about 7 carbon atom and a para-alkylstyrene, wherein a grafted macromonomer such as a terminally functionalized polystyryl chain of very narrow molecular weight distribution is attached to the para-alkyl group of the para-alkylstyrene such that entanglement of adjacent chains in the melt are inhibited. In addition to distributed macromonomer grafts, other functionality may be attached to the para-alkyl group of the para-alkylstyrene to introduce other desirable properties such as radiation curability. In another embodiment the macromolecule comprises a polymer of one or more simple olefinic monomers wherein a macromolecule is attached to pendent functionality and/or copolymerized into the polymer backbone. A particularly preferred macromonomer comprises a terminal norbornene functional group.

32 Claims, 2 Drawing Sheets