United States Patent Office 3,813,341 Patented May 28, 1974

3,813,341

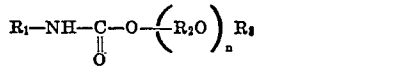
DERIVATIVES OF GLYCOLS, GLYCOL ETHERS AND GLYCOL ESTERS

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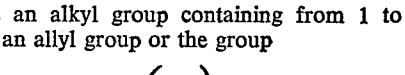
No Drawing. Original application Mar. 9, 1971, Ser. No. 122,558, now abandoned. Divided and this application Aug. 14, 1972, Ser. No. 280,101
Claims priority, application Great Britain, Mar. 9, 1970, 11,273/70
Int. Cl. C09k 3/00
U.S. Cl. 252—77 9 Claims

ABSTRACT OF THE DISCLOSURE

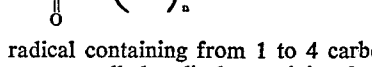
Novel glycol urethanes have the general formula:



wherein R_1 is an alkyl group containing from 1 to 4 carbon atoms, an allyl group or the group



R_2 is an alkylene radical containing from 1 to 4 carbon atoms; R_3 is hydrogen, an alkyl radical containing from 1 to 4 carbon atoms, or one of the groups



is an alkyl radical containing from 1 to 4 carbon atoms; R_6 is an alkylene group containing from 1 to 10 carbon atoms; R_7 is an alkyl group containing from 1 to 4 carbon atoms or the group



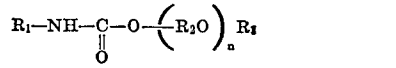
and each n is the same or different and is an integer of from 1 to 6 and when any n is an integer greater than 1, each R_2 may be the same or different.

A method of preparing the novel compounds and hydraulic fluids consisting of, or comprising the novel compounds are also described.

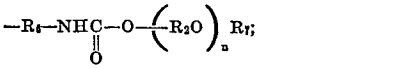
This is a division of application Ser. No. 122,558, filed Mar. 9, 1971 and now abandoned.

The invention relates to derivatives of glycols, glycol ethers and glycol esters, the preparation of the derivatives and hydraulic fluids containing them.

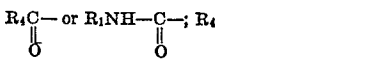
According to the present invention there are provided glycol urethanes having the general formula:



wherein R_1 is an alkyl group containing from 1 to 4 carbon atoms, an allyl group or the group

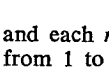


is an alkyl radical containing from 1 to 4 carbon atoms; R_6 is an alkylene group containing from 1 to 10 R_3 is hydrogen, an alkyl radical containing from 1 to 4 carbon atoms, or one of the groups



R_4 is an alkyl radical containing from 1 to 4 carbon atoms; R_6 is an alkylene group containing from 1 to 10,

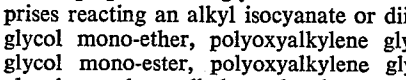
preferably from 2 to 8, carbon atoms; R_7 is an alkyl group containing from 1 to 4 carbon atoms or the group



and each n is the same or different and is an integer of from 1 to 6, preferably 1 to 4, more preferably 2 or 3, and when any n is an integer greater than 1, each R_2 may be the same or different.

The compounds of the present invention may be readily prepared by reacting an alkyl isocyanate or diisocyanate with the appropriate glycol mono-ether, polyoxylakylene glycol mono-ether, glycol mono-ester, polyoxyalkylene glycol mono-ester, glycol or polyoxyalkylene glycol, and such preparation is within the scope of the present invention.

Accordingly the invention further provides a process for the preparation of glycol urethanes which process comprises reacting an alkyl isocyanate or diisocyanate with a glycol mono-ether, polyoxyalkylene glycol mono-ether, glycol mono-ester, polyoxyalkylene glycol mono-ester, glycol or polyoxyalkylene glycol to produce a compound having the general formula:



wherein R_1, R_2, R_3 and n are as hereinbefore defined.

The reaction may be carried out at a temperature of from room temperature to 150° C, optionally in the presence of an inert solvent such as dimethyl formamide, petroleum ether, benzene or toluene. If desired the reaction may be carried out in an inert atmosphere e.g. nitrogen.

The compounds are believed to be new, and are useful as functional fluids or components for functional fluids such as hydraulic fluids.

The compounds, or mixtures thereof, particularly suitable for use as hydraulic fluids are those having a boiling point of at least 190° C., preferably at least 230° C., more preferably at least 260° C., and a kinematic viscosity at −40° C. of not more than 5000 cst., preferably not more than 2000 cst.

In particular, certain of the compounds are useful as additives or components in hydraulic brake and clutch fluids when low hygroscopicity is of prime consideration. In recently developed hydraulic brake and clutch fluids having low hygroscopicity, it has been the practice to include small amounts of glycols and glycol ethers in order to render these fluids miscible with up to 5% of water. These glycols or glycol ethers impart a small degree of hygroscopicity to the fluids. The compounds of the present invention have very low hygroscopicities and are also partially miscible with water. Furthermore, the compounds of the present invention are particularly good in respect of their rubber swell characteristics, many of them when used alone shrinking the rubbers used in hydraulic brake and clutch systems. Thus the compounds of the present invention may be suitably blended with other compounds which are suitable for use as hydraulic fluids but which swell the rubbers used in the hydraulic brake and clutch systems.

The invention therefore includes a hydraulic fluid consisting of, or comprising, a compound in accordance with the present invention or a mixture of such compounds.

In one aspect of the present invention the hydraulic fluid comprises from 1% to 99%, by weight based on the weight of the hydraulic fluid, of the compound or mixture of compounds.

Preferably the hydraulic fluid comprises from 5% to 99%, more preferably 5% to 80%, especially 10% to 70%, of the compound or mixture of compounds. When

used as rubber shrinking additives the compounds of the present invention are preferably used in amounts from 1% to 10%, more particularly 2% to 5%.

It is particularly preferred that the hydraulic fluid should have a viscosity of not more than 5000 cst., preferably not more than 2000 cst., at —40° C. and a boiling point of at least 230° C., particularly more than 260° C.

Particularly useful fluids which may be blended with or contain the compounds of the present invention include (poly)oxyalkylene glycol ether esters of dicarboxylic acids, such as those described in British Patent Specification No. 1,083,324, or esters of acetic, propionic or butyric acids with di- or polyoxyalkylene glycols or combinations of these two types of esters as disclosed in Belgian Patent Specification No. 749,904. Other base fluids with which the compounds of the present invention may be blended are the well-known polyoxyalkylene glycol and glycol ether fluids, which are exemplified in U.K. Patent Specification No. 1,055,641. Further components which may be present are the orthoesters and the borate esters disclosed in co-pending United States Application Ser. No. 251,524, filed May 8, 1972 and Ser. No. 219,504, filed Jan. 20, 1972 respectively.

It is to be understood that the hydraulic fluids of the present invention may also include conventional hydraulic fluid additives such as lubricity additives, antioxidants, corrosion inhibitors, etc.

Typical additives which may be used in the hydraulic fluids of the invention are lubricity additives selected from castor oil or castor oil treated in various ways, for example,

Firsts Castor Oil,
Castor oil to Specification DTD72
Blown castor oil, i.e. castor oil blown with air or oxygen while being heated.
Special Pale Blown Castor Oil, i.e. a similarly blown castor oil.
"Hydricin 4" i.e. a commercially available ethylene/oxide/propylene oxide treated castor oil.

Other lubricity additives which may be incorporated in hydraulic fluids in accordance with the present invention include borate esters e.g. tricresyl borate and phosphorus-containing esters, especially phosphates e.g. tricresyl phosphate.

The hydraulic fluids of the present invention may also include minor proportions of polyoxyalkylene glycols or ethers thereof e.g. those sold by Union Carbide Corporation under the Registered Trade mark "Ucon," particularly those of the LB and HB series. Suitable examples of these polyoxyalkylene glycols and their ethers and esters are given in British Patent Specification No. 1,055,641. Other suitable lubricity agents are orthophosphate or sulphate salts of primary or secondary aliphatic amines having a total of from 4 to 24 carbon atoms, dialkyl citrates having an average of from 3½ to 13 carbon atoms in the alkyl groups, aliphatic dicarboxylic acids and esters thereof, specific examples being

Diamylamine orthophosphate
Dinonylamine orthophosphate
Diamylamine sulphate
Dinonyl citrate
Di(2-ethyl hexyl)citrate
Polyoxyethylene sebacate derived from a polyoxyethylene glycol of M.W. 200
Polyoxyethylene azelate derived from a polyoxyethylene glycol of M.W. 200
Polyoxyethylene adipate derived from a polyoxyethylene glycol of M.W. 200
Polyoxyethylene/polyoxypropylene glutarate derived from mixed polyoxyglycols of average M.W. of about 200
Glutaric acid
Azelaic acid
Sebacic acid
Succinic acid
Di ethyl sebacate
Di 2-ethyl hexyl sebacate
Di iso octyl azelate

Unsaturated aliphatic acids or their salts may also be used e.g. oleic acid or potassium ricinoleate.

Corrosion inhibitors which may be used in the present invention may be selected from heterocyclic nitrogen containing compounds, e.g. benzotriazole and benzotriazole derivatives such as those described in British Patent Specification No. 1,061,904 or mercapto benzothiazole. Many amines or derivatives thereof are also suitable as corrosion inhibitors, for example

di n-butylamine
di n-amylamine
cyclohexylamine
morpholine
triethanolamine

and soluble salts thereof e.g. cyclohexylamine carbonate.

Phosphites are also good corrosion inhibitors e.g.

Tri phenyl phosphite
Di isopropyl phosphite

and certain inorganic salts may be incorporated e.g. sodium nitrate.

Other additives which may be included are antioxidants such as diarylamines e.g. diphenylamine, p,p'-dioctyl-diphenylamine, phenyl - α - naphthylamine or phenyl - β-naphthylamine. Other suitable antioxidants are those commonly known as hindered phenols which are exemplified by

2,4 dimethyl-6-t-butyl phenol
2,6 di-t-butyl-4-methylphenol
2,6 di-t-butyl phenol
1,1 bis (3,5 di-t-butyl-4-hydroxyphenyl)methane
3,3',5,5' tetra-t-butyl-4-4'-dihydroxydiphenyl
3-methyl 4,6-di-t-butyl phenol
4-methyl-2-t-butyl phenol

Yet further additives which may be used are phenothiazine and its derivatives, for example those having alkyl, or aryl, groups attached to the nitrogen atom or to the aryl groups of the molecule.

Other additives which may be used include alkylene oxide/ammonia condensation products as corrosion inhibitor, for example the propylene oxide/ammonia condensation product described in Belgian Pat. No. 749904. Further lubricity additives which may be used are complex esters, such as that sold under the trade name Reoplex 641 and also described in Belgian Pat. No. 749904. Moreover, long chain (e.g. C_{10-18}) primary amine corrosion inhibitors and polymerized quinoline resin antioxidants, as described in Belgian Pat. No. 749904, may be used, examples of such amines and resins being the commercially available materials Armeen 12D and Agerite resin D respectively.

Conventional additives such as those hereinbefore described are normally employed in small amounts such as 0.05% to 10% for example, 0.1% to 2% by weight.

In another aspect of the present invention there is provided a hydraulic system containing the hydraulic fluids of the present invention. In a further aspect there is provided a method of transmitting power, which method comprises introducing the hydraulic fluids of the present invention into a hydraulic system and transmitting power by applying pressure thereto.

The compounds of the present invention, their preparation and hydraulic fluids containing them, will now be illustrated with reference to the following examples.

EXAMPLE 1

Methyl diglycol N-ethyl urethane

94 g. (0.78 mole) of diethylene glycol monomethyl ether which has been dried over molecular sieves for 24 hours and 50 g. (0.705 mole) of ethyl isocyanate were slowly mixed, each dissolved in 40 ml. of dimethyl form-

amide. A slight exotherm to 35° C. was noticed. The reaction mixture was stirred at 100° C. for three hours under nitrogen. At the end of this period the mixture was stripped at 220° C. under 5 mm. Hg. The resultant product was shown to be the desired compound, together with a small amount of glycol ether, by infra-red spectroscopy. The product was found to contain 7.77% N (calculated 7.34%) and was obtained in 48% yield.

Further compounds were prepared in substantially the same manner, details of these preparations being specified in Examples 2 to 20 given in the following Table I.

TABLE I

Example number	Compound	Glycol	Wt. (g.)	Mole	Isocyanate	Wt. (g.)	Mole	Reaction conditions (° C./hrs.)	Stripping conditions (° C./mm.)	Percent nitrogen Found	Percent nitrogen Calc.	Yield, percent
2	Ethyl triglycol N-ethyl urethane	Triethylene glycol mono ethyl ether	139	0.78	Ethyl	50	0.705	100/3	240/2	5.60	5.62	46
3	Methyl triglycol N-ethyl urethane	Triethylene glycol mono methyl ether	128	0.78	do	50	0.705	100/10	210/1	5.48	5.96	71
4	Methyl diglycol N-propyl urethane	Diethylene glycol mono methyl ether	96	0.80	n-Propyl	68	0.80	[1] 100/3	150/230	6.68	6.83	75
5	Methyltriglycol N-ethyl urethane	Triethylene glycol mono methyl ether	500	3.12	Ethyl	200	2.82	[1] 100/3	120/2	5.62	5.96	
6	do	do	2,706	16.5	do	1,065	15.0	[1] 100/4	185/—	5.9	5.96	99
7	Methyl diglycol-N-n-butyl urethane	Diethylene glycol monomethyl ether	96	0.8	n-Butyl	79	0.80	[1] 100/3	150/230	7.15	6.4	87.5
8	Dipropylene glycol monomethyl ether N-ethyl urethane.	Dipropylene glycol mono methyl ether	148	1.0	Ethyl	71	1.0	[1] 100/2	120/4	6.5	6.37	47.5
9	Methyl diglycol-N-t-butyl urethane	Diethylene glycol mono methyl ether	120	1.0	t-Butyl	99	1.0	[1] 130/4	150/7	6.22	6.4	76
10	Diethylene glycol bis (N-ethyl urethane)	Diethylene glycol	38.5	0.75	Ethyl	106.5	1.5	[1] 100/3		11.34	11.3	56.5
11	do	do	77	1.5	do	213	3.0	100/3		11.4	11.3	44.0
12	Triethylene glycol bis (N-ethyl/propyl urethane).	Triethylene glycol	164	1.0	Ethyl/propyl	71 Et. / 85 Pr.	1.0 Et. / 1.0 Pr.	[1] 100/3	190/5	8.62	9.2	95.6
13	Ethylene glycol mono-N-ethyl urethane	Ethylene glycol	516	6.0	Ethyl	213	3.0	[1] 100/3	[3] 74–108/9	10.9	10.52	58.0
14	Bis methyl diglycol-N, N'-hexamethylene diurethane.	Diethylene glycol mono-methyl ether	78.7	0.656	Hexamethylene diisocyanate.	50	0.298	[1] 100/7	190/—	7.18	6.85	89.0
15	Ethyl diglycol/ethyl triglycol-N, N'-hexamethylene diurethane.	EDG/ETG [4]	44 EDG / 58.4 ETG	0.328 EDG / 0.328 ETG	do	50	0.298	[1] 100/3	200/—	6.10	5.84	90.0
16	Methyl triglycol-N-allyl urethane	Triethylene glycol monomethyl ether	88	0.66	Allyl	50	0.6	[1] [2] 100/2	180/—	5.51	5.66	94.0
17	Ethyl triglycol-N-allyl urethane	Triethylene glycol monoethyl ether	97	0.66	do	50	0.6	[1] 100/3	210/10	4.54	5.36	
18	Hexamethylene glycol bis (N-ethyl urethane)	Hexamethylene glycol	118	1.0	Ethyl	160	2.2	100/3	[5]	10.7	10.8	
19	Hexamethylene glycol bis (N-ethyl/propyl urethane).	do	118	1.0	Ethyl/propyl	78 Et. / 93 Pr.	1.1 Et. / 1.1 Pr.	100/3	[5]	10.2	10.2	
20	Ethylene glycol bis (N-ethyl urethane)	Ethylene glycol	372	6.0	Ethyl	213	3.0	100/3	110/1.5	13.1	13.72	

[1] No solvent used.
[2] Plus 4 hours at 50° C.
[3] Restricted twice.
[4] (EDG—diethylene glycol monoethyl ether.
(ETG—triethylene glycol monoethyl ether.
[5] Not stripped.

EXAMPLE 21

The propionate ester of triethylene glycol mono(N-ethyl urethane) was prepared in admixture with triethylene glycol propionate (a useful hydraulic fluid component) by reaction of ethyl isocyanate with incompletely esterified triethylene glycol. Propionic acid (3.2 moles, 237 g.) was refluxed in 100 mls. of toluene under a Dean & Stark head with triethylene glycol (2.0 moles, 300 g.) until the acid value ceased to fall (14 hours). Thereafter the product was stripped at 200° C. and 5 mm. Hg to yield the incompletely esterified glycol of acid value 1.5 mg. KOH/g. Ethyl isocyanate (0.8 mole, 56.8 g.) was added dropwise to the stripped product at room temperature. No exotherm was noticed. The reactants were heated at 100° C. for 3 hours under nitrogen and after cooling, the product was taken up in an equal volume of diethyl ether, washed with 3 portions of water and finally stripped at 130° C. under bench vacuum. 392 g. (73%) of the desired product, triethylene glycol dipropionate and the propionate ester of triethylene glycol mono(N-ethyl urethane) in 4:1 molar ratio, was obtained.

EXAMPLE 22

A 9:1 molar ratio mixture of triethylene glycol dipropionate and propionate ester of mono(N-ethyl urethane) was prepared in a similar manner to Example 21. 400 g. (5.4 moles) of propionic acid was esterified with 450 g. (3.0 moles) of triethylene glycol in 200 mls. of toluene and in the presence of 9 g. carbon (decolorizer). Total reaction time was 17 hours and the products had an acid value, after stripping, of 1.6 mg. KOH/g., 42.6 g. (0.6 mole) ethyl isocyanate was reacted with the stripped product for 2 hours at 100° C. under a nitrogen atomsphere and the product stripped at 200° C. and 6 mm. Hg, without prior washing, to yield 658 g. (83%) of the desired product.

The suitability of the glycol urethanes for inclusion in hydraulic fluids was evaluated by determining the following properties:

(a) the boiling point of typical glycol urethane;
(b) the viscosity of typical glycol urethanes at —40° C.; and
(c) the effect i.e. swelling effect, of typical glycol urethanes on a synthetic styrene/butadiene rubber and a natural rubber, both being of the kind commonly employed in hydraulic systems.

The properties, so determined, are set out in the following Table II.

Blends of the glycol urethanes with other hydraulic fluid components were also tested and the resutls are set

out in the following Table III, in which Base Blend A consisted of the following components:

	Percent
Di(monomethyl ether of diethyl glycol)nylonate	39
Triethylene glycol dipropionate (TEGDP)	45
Monomethyl ether of triethylene glycol	5
Monoethyl ether of triethylene glycol	5
Reoplex 641 (a commercially available lubricity additive)	3
Amine A	3

Plus the following combination of additives:

	Percent
Di-n-butyalmine (DBA)	0.05
Benzotriazole (BTZ)	0.05
Triphenyl phosphite (TPP)	0.15
Commercially available primary, saturated, straight chain aliphatic monoamine (95% primary, 5% secondary and tertiary amines; the alkyl chains being 97% C_{12}; 2% C_{14} and 1% C_{10})	0.1
Agerite Resin D (commercially available polymerized trimethyl dihydro quinoline resin)	0.05

Amine A was a condensation product of propylene oxide (5.5 moles) with ammonia (1 mole) and Reoplex 641 was a complex ester of molecular weight about 712 derived from neopentyl glycol and a mixture of sebacic, azelaic and adipic acids in respective proportions, determined by analysis, of 53%, 5% and 38%. The nylonate ester was an ester of a mixture of dicarboxylic acids as described in U.K. Patent Specification No. 1,083,324.

Further blends tested were as follows:

BLEND B

	Percent
Product of Example 6	57
TEGDP	30
Ethyl triglycol	10
Amine A	3
DBA	0.1
BTZ	0.1
TPP	0.1

This was found to be a useful hydraulic fluid having a boiling point of 285° C. and a viscosity of 1775 cst. at −40° C. Rubber swell tests (at 120° C.) on the synthetic rubber hereinbefore described resulted in rubber swell of 9.3% after 3 days, 9.1% after 1 week and 8.7% after 2 weeks. Further rubber swell tests using a S.A.E. standard SBR cup resulted in rubber swell of 0.62 mm. after 5 days at 70° C. and 0.93 mm. after 3 days at 120° C.

BLEND C

	Percent
Product of Example 6	72
Solvent 36	26
LPE 504	2
DBA	0.1
BTZ	0.1
TPP	0.1

This was also found to be a useful fluid having a boiling point of 268° C. and a viscosity of 1698 cst. at −40° C. Rubber swell tests (at 120° C.) on the synthetic rubber previously referred to resulted in a rubber swell of 4.8% after 3 days, 4.8% after 1 week and 4.0% after 2 weeks. In the case of S.A.E. SBR cups, rubber swell after 5 days at 70° C. was 0.39 mm. and after 3 days at 120° C. was 0.54 mm.

Solvent 36 is a glycol mono-ether mixture supplied by Union Carbide Corporation consisting of about 48% diethylene glycol mono-ethyl ether and 43% triethylene glycol mono-ethyl ether, together with small amounts of glycols and other glycol mono-ethyl and mono-methyl ethers. LPE 504 is a commercially available pentaerythritol tetraester supplied by Geigy (U.K.) LTD.

The effect of hygroscopicity on the boiling point of the product of Example 6, Blends B and C and Base Blend A was tested by exposing samples to 50% relative humidity at 70° F. for 16 hours. Results obtained were as follows:

Test sample	B.P., ° C. Before exposure	B.P., ° C. After exposure
Product of Example 6	280	235
Blend B	285	220
Blend C	268	190
Base Blend A	300	200

TABLE II.—GLYCOL URETHANE PROPERTIES

Glycol urethane	B.P. (° C.)	Viscosity at −40° C. (est.)	Rubber test specimen	Long term rubber swell test, percent volume increase at 70° C. in— 3 days	1 week	2 weeks	4 weeks	8 weeks	12 weeks
Product of—									
Example 1	247	2,872	Natural	6.1					
			Synthetic *	12.5					
Example 4	257	2,993	Natural	1.8	2.1	2.6	2.6	2.9	2.7
			Synthetic *	15.5	15.7	17.1	17.1	17.5	15.7
Example 5	281	3,860	Natural	−2.2	−2.4	−2.6	−2.7	−2.9	−2.7
			Synthetic *	3.6	3.4	3.4	3.5	3.2	3.2
Example 10	277	Solid	Natural	−1.9	−2.1	−2.5	−2.8	−2.8	−2.6
			Synthetic *	−1.5	−1.2	−2.1	−2.4	−2.8	−2.8
Example 12	281		Natural	−2.1	−2.7	−2.5	−2.6	−2.8	−2.9
			Synthetic *	−2.6	−3.10	−4.5	−4.6	−4.3	−4.9
Example 15		Solid	Natural	−1.9	−2.8	−3.9			
			Synthetic *	2.9	−3.8	−3.6			
Example 16		4,087	Natural	−1.2	−1.1	−1.3	−1.5		
			Synthetic *	2.1	1.8	1.3	1.4		
Example 17	294	3,116	Natural						
			Synthetic *	6.4	6.1				
Example 20			Natural						
			Synthetic *	−2.5	−2.8	−2.8	−2.8	−2.7	−2.9
Example 21	297	2,623	Natural	1.3	1.3	1.6	1.5	1.8	1.2
			Synthetic *	13.5	12.4	12.7	12.3	12.4	10.1
Example 22	300	1,577	Natural	3.6	3.8	4.0	4.2		
			Synthetic *	17.2	14.2	14.6	15.3		

* Test carried out at 120° C.

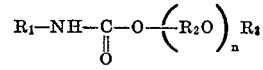
TABLE III.—PROPERTIES OF GLYCOL URETHANE-CONTAINING BLENDS

Blend	Viscosity B.P. (° C.)	Viscosity at −40° C. (cst.)	Rubber test specimen	Long term rubber swell test, percent volume increase at 70° C. in— 3 days	1 week	2 weeks	4 weeks	8 weeks	12 weeks
Base Blend A:									
Plus 10% product of Ex. 14			Synthetic [1]	9.7	10.7				
Plus 10% product of Ex. 15			do	9.9	10.3				
Plus 10% product of Ex. 18			do	12.2	11.3				
Plus 10% product of Ex. 19			do	11.9	11.6				
Base Blend A	300	1,791	do	15.5					
TEGDP 95% product of Ex. 11, 5%			Natural	6.0	6.4	6.0	5.1	2.2	−3.3
			Synthetic [1]	20.0	20.4	21.2	21.1	19.3	19.9
TEGDP 100%			Natural	6.9	7.6	7.6	5.5	4.5	1.7
			Synthetic [1]	29.9	28.9	26.5	23.4	20.7	18.9
EDG 95% product of Ex. 11, 5%			Natural	3.8	4.2	5.2	4.6	6.3	1.6
			Synthetic [1]	15.5	16.4	14.9	14.3	14.2	13.2
Ethyl diglycol 100%			Natural	4.8	5.4	6.0	5.3	5.6	3.8
			Synthetic [1]	17.0	17.8	17.2	16.9	16.1	
Product of Ex. 6A [2] 46%, TEGDP 44%, Ethyl triglycol 7%, Amine A 3%, plus the same combination of additives as in Base Blend A.	288	1,716	Natural	2.3	2.7	3.2	3.3		
			Synthetic [1]	12.5	13.0	12.3	12.4		

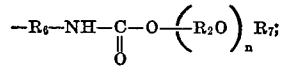
[1] Test carried out at 120° C.
[2] A repetition of Example 6 in which the reaction was carried out for 3 hours at 100° C. and stripping was carried out at 200° C./2-4 mm. Hg.

We claim:

1. A hydraulic fluid consisting essentially of a blend of from 1% to 99% by weight, based on the total weight of the hydraulic fluids, of at least one glycol urethane having the general formula:



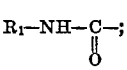
wherein R_1 is selected from the group consisting of alkyl groups containing from 1 to 4 carbon atoms, allyl groups and groups having the formula



R_2 is an alkylene radical containing from 1 to 4 carbon atoms; R_3 is selected from the group consisting of hydrogen atoms, alkyl radicals containing from 1 to 4 carbon atoms, the group



and the group



R_4 is an alkyl radical containing from 1 to 4 carbon atoms; R_6 is an alkylene group containing from 1 to 10 carbon atoms; R_7 is selected from the group consisting of alkyl groups containing from 1 to 4 carbon atoms and the group



and each *n* is the same or different and is an integer of from 1 to 6 and when any *n* is an integer greater than 1, each R_2 may be the same or different, with at least one hydraulic fluid base stock selected from the group consisting of (poly)oxyalkylene glycol ether esters of dicarboxylic acids, esters of acetic, propionic or butyric acids with di- or polyoxyalkylene glycols, polyoxyalkylene glycols, glycol ethers, orthoesters and borate esters.

2. A hydraulic fluid according to claim **1** wherein the glycol urethane or glycol urethanes consist of from 10% to 70% of the blend.

3. A hydraulic fluid according to claim **1** containing a hydraulic fluids base stock comprising at least one polyoxyalkylene glycol ether ester of a dicarboxylic acid.

4. A hydraulic fluid according to claim **1** containing a hydraulic base stock comprising at least one ester of a di- or polyoxyalkylene glycol with an acid selected from the group consisting of acetic acid, propionic acid and butyric acid.

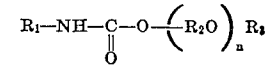
5. A hydraulic fluid according to claim **1** wherein each R_2 is the same or different and is selected from the group consisting of ethylene groups and propylene groups; R_6 is an alkylene group containing from 2 to 8 carbon atoms; and each *n* is an integar selected from the group consisting of 2 and 3.

6. A hydraulic fluid according to claim **1** containing from about 0.05 to 10% by weight of an organic corrosion inhibitor.

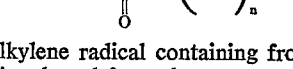
7. A hydraulic fluid according to claim **1** containing from about 0.05 to 10% by weight of an organic antioxidant.

8. A hydraulic fluid according to claim **1** containing from about 0.05 to 10% by weight of an organic lubricity agent.

9. A method of transmitting power in a hydraulic system which method comprises introducing into the system a hydraulic fluid consisting essentially of at least one glycol urethane having the general formula:



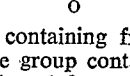
wherein R_1 is selected from the group consisting of alkyl groups containing from 1 to 4 carbon atoms, allyl groups and groups having the formula



R_2 is an alkylene radical containing from 1 to 4 carbon atoms; R_3 is selected from the group consisting of hydrogen atoms, alkyl radicals containing from 1 to 4 carbon atoms, the group



and the group



R_4 is an alkyl radical containing from 1 to 4 carbon atoms; R_6 is an alkylene group containing from 1 to 10 carbon atoms; R_7 is selected from the group consisting of alkyl groups containing from 1 to 4 carbon atoms and the group



and each *n* is the same or different and is an integer of from 1 to 6 and when any *n* is an integer greater than 1, each R_2 may be the same or different, and transmitting power by applying pressure to the said hydraulic fluid.

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LEON D. ROSDOL, Primary Examiner

H. A. PITLICK, Assistant Examiner

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