



(12) **United States Patent**
Rutledge

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(54) **FIBERGLASS SUCKER ROD END FITTING**

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Related U.S. Application Data

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(51) **Int. Cl.⁷** **B25G 3/34**

(52) **U.S. Cl.** **403/268; 403/265; 403/269**

(58) **Field of Search** 403/265, 268, 403/269

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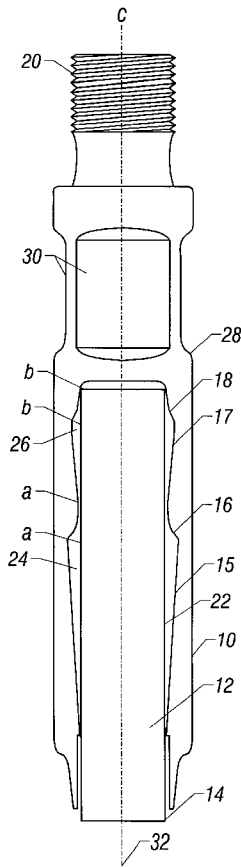
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(57) **ABSTRACT**

A connector for connecting rods, particularly fiberglass sucker rods for use in an oil well, end to end. The connector comprises a rod receptacle having an interior surface shaped to form at least one, but preferably a plurality, of annuluses between the rod and the interior surface of the rod receptacle. The annulus(es) are filled with an initially flowable adhesive which hardens in the annular space(s) to form a wedge or series of axially aligned wedges. The wedge or wedges comprise an annularly thin portion and an annularly thick portion distal to the thin portion. The thick portion of the wedge approaches the rod within the receptacle distal to the thin portion. In the present connector, the thick portion of the wedge or wedges approaches the rod asymptotically.

30 Claims, 34 Drawing Sheets



Pet'rs Exhibit 1003

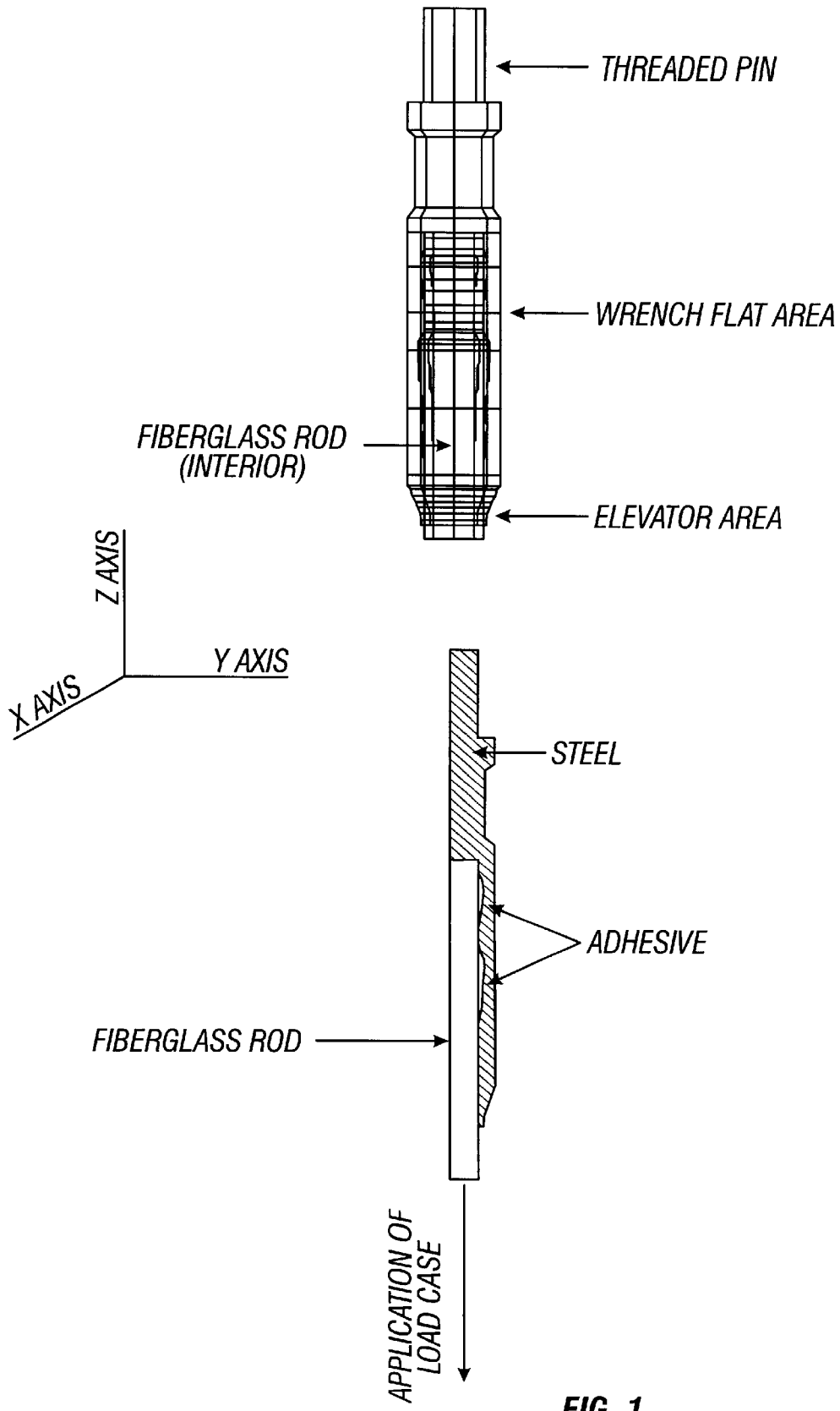


FIG. 1

	-0.80	-0.75	-0.70	-0.65	-0.60	-0.55	-0.50	-0.40	-0.35	-0.30	-0.25	-0.20	-0.1
7.30	830	947	1130	1696	4892	15409	27577	13254	10998	9413	8363	7704	740
7.20	2982	3198	4317	2590	8817	13359	17422	18162	16016	14147	12736	11685	1095
7.10	3402	4115	5638	7750	10223	12730	15261	17472	17216	16491	15626	14828	1418
7.00	3566	4376	5946	8083	10476	12782	14712	16914	17224	17167	16894	16533	1617
6.90	3721	4499	6165	8682	11173	13141	14570	16281	16707	16920	16977	16935	1680
6.80		4217	7485	11055	12756	12963	13626	14903	15385	15758	16030	16219	1634
6.70				18716	13919	13115	13360	14271	14693	15051	15330	15559	1571
6.60				15110	14990	14525	14187	14282	14487	14706	14909	15080	1521
6.50				14765	14794	14722	14613	14526	14572	14653	14746	14836	1491
6.40				14666	14715	14727	14711	14667	14662	14671	14691	14714	1473
6.30				14617	14678	14717	14730	14704	14678	14649	14622	14597	1457
6.20				14585	14665	14714	14731	14677	14618	14548	14475	14404	1434
6.10				14577	14680	14732	14731	14591	14472	14338	14199	14069	1395
6.00				14620	14751	14791	14742	14431	14209	13973	13740	13528	1335
5.90				14773	14932	14926	14772	14154	13773	13391	13035	12724	1246
5.80				15155	15331	15197	14813	13672	13075	12525	12041	11634	1131
5.70				16050	16191	15647	14723	12809	12023	11355	10795	10338	998
5.60				18619	17994	15539	13677	11472	10703	10056	9510	9058	8700
5.50				25564	15418	13323	12068	10497	9830	9216	8667	8201	873
5.40	10818	8019	11690	16010	14216	14216	12639	10604	9740	8965	8307	7783	739
5.30	5196	9890	12019	13831	14804	14633	13707	11134	9946	8989	8259	7831	754
5.20	8332	9890	12019	13664	14715	15069	14528	11226	9844	9067	8694	8531	846
5.10	10874	11269	12163	13181	14197	15168	15182	10211	10181	10389	10576	10712	1081
5.00	12426	12548	12842	13230	13784	16300	18474	4908	5064	5176	5245	5294	533
4.90	13913	13825	13974	14246	14557	15110	3372	4444	4798	5007	5139	5227	528
4.80	15055	14975	15335	15716	15636	13745	4113	4096	4397	4645	4829	4959	504
4.70	15017	15547	16362	17240	15965	14713	3644	3958	4289	4436	4570	4681	476
4.60	14159	15535	18058	22278	25903	324	3646	3961	4115	4242	4347	4435	450
4.50	13979	15606	18729	23381	26906	302	3781	3922	4001	4086	4165	4234	428
4.40	14859	15969	17155	20126	21052	340	3890	3881	3939	3998	4052	4098	413
4.30	15629	15898	16682	16813	16813	391	3890	3942	3959	3979	4002	4025	404
4.20	15858	15615	15379	15141	14357	371	3904	3977	3969	3986	3974	3987	400
4.10	15609	15157	14736	13742	12896	324	4268	3911	3924	3952	3972	3986	399
4.00	15261	14717	14127	13748	12759	3945	3945	4125	4066	4049	4039	4032	402
3.90	15026	14411	13687	12869	11973	10738	3912	4118	4138	4118	4092	4069	405
3.80	15037	14311	13429	12429	11345	9941	4118	4134	4117	4089	4078	4058	404

(A)

(C)

(B)

FIG.

	0.00	0.5	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	-0.60
Ⓜ 10597	9297	7569	7405	7704	8363	9413	10998	13254	20025	27577	15409	4892	1699	
11728	11078	10553	10950	11685	12736	14147	16016	18162	19174	17422	13359	8817	2599	
13719	13693	13733	14181	14828	15626	16491	17216	17472	16887	15261	12730	10223	7750	
15576	15734	15889	16178	16533	16894	17167	17224	16914	16101	14712	12782	10476	8088	
16536	16657	16743	16802	16935	16977	16920	16707	16281	15589	14570	13141	11173	8688	
16606	16647	16649	16341	16219	16030	15758	15385	14903	14313	13626	12963	12756	11055	
15912	15880	15824	15719	15559	15330	15051	14693	14271	13807	13360	13115	13919	18719	
15640	15365	15310	15215	15080	14909	14706	14487	14282	14148	14187	14525	14990	15117	
15198	15187	14970	14913	14836	14746	14653	14572	14526	14537	14613	14722	14794	14766	
14778	14769	14754	14736	14714	14691	14671	14662	14667	14686	14711	14727	14715	14666	
14550	14556	14561	14576	14597	14622	14649	14678	14704	14724	14730	14717	14678	14611	
14255	14273	14294	14342	14404	14475	14548	14618	14677	14717	14731	14714	14665	14588	
13809	13835	13870	13956	14069	14199	14338	14472	14591	14681	14731	14732	14680	14577	
13153	13175	13217	13350	13528	13740	13973	14209	14431	14651	14742	14791	14751	14622	
12661	12255	12288	12469	12724	13035	13391	13773	14154	14500	14772	14926	14932	14773	
11169	11100	11095	11314	11634	12041	12525	13075	13672	14274	14813	15197	15331	15110	
9980	9820	9755	9985	10338	10795	11355	12023	12809	13720	14723	15647	16191	16050	
8828	8594	8484	8708	9058	9510	10056	10703	11472	12422	13677	15539	17994	18619	
7882	7626	7596	8737	8201	8667	9216	9830	10497	11224	12068	13323	15418	25566	
7103	7064	7150	7399	7783	8307	8965	9740	10604	11556	12639	14216	14216	16010	
7408	7324	7380	7542	7831	8259	8989	9946	11134	12446	13707	14633	14804	13833	
9071	8743	8472	8467	8531	8694	9067	9844	11226	13045	14528	15069	14715	13666	
Ⓛ 11438	11162	10907	10810	10712	10576	10389	10181	10211	11627	15182	15168	14197	13181	
5400	5387	5362	5330	5294	5245	5176	5064	4908	4234	18474	16300	13784	13230	
5338	5336	5321	5286	5227	5139	5007	4798	4444	3817	3312	15110	14557	14246	
5156	5139	5105	5048	4959	4829	4645	4397	4096	3785	4113	13745	15636	15716	
4889	4865	4826	4766	4681	4570	4436	4289	3958	3881	3644	14713	15965	17240	
4612	4590	4555	4505	4435	4347	4242	4115	3961	3755	3646	324	25903	22278	
4373	4355	4329	4289	4234	4165	4086	4001	3922	3833	3781	302	26906	23388	
4195	4183	4165	4137	4098	4052	3998	3939	3881	3865	3890	340	21052	20122	
4081	4073	4063	4046	4025	4002	3979	3959	3942	3918	3890	391	16813	16842	
4022	4017	4010	4000	3987	3974	3986	3969	3977	3935	3904	371	14357	15147	
4008	4004	4001	3995	3986	3972	3952	3924	3911	4053	4268	12493	12896	13742	
4019	4020	4022	4026	4032	4039	4049	4066	4125	4083	3945	11648	12759	13748	
4029	4033	4040	4052	4069	4092	4118	4138	4118	3996	3912	10738	11973	12869	
4025	4027	4032	4043	4058	4078	4089	4117	4134	4163	4118	9941	11345	12429	

Ⓜ Ⓛ

FIG

(A)	3.70	15380	14457	13391	21181	10867	9099	4396	4191	4121	4077	4050	4034
	3.60	16076	14896	13602	12170	10586	8299	4702	4204	4114	4073	4050	4050
	3.50	17025	15580	14145	12563	10727	7764	6251	4168	4168	4162	4154	4147
	3.40	17869	16469	15270	1371	11933	8614	3088	4479	4392	4340	4307	4285
	3.30	17848	17285	16921	15851	12873	850	4394	4335	4386	4388	4378	4367
	3.20	16533	17691	18765	20185	523	497	4011	4266	4307	4254	4354	4364
	3.10	15549	17819	20680	26261	350	2052	3881	4093	4207	4254	4285	4307
	3.00	16474	18551	20860	24212	351	2092	3893	4056	4119	4167	4204	4231
	2.90	17779	18831	20059	22064	363	2172	3972	4035	4111	4111	4142	4167
	2.80	18347	18540	18902	19180	375	2218	4052	4064	4079	4098	4116	4132
	2.70	18278	1800	17840	17466	386	386	4123	4108	4108	4113	4120	4127
	2.60	17840	17376	16988	16221	15767	394	2305	4155	4149	4145	4144	4143
	2.50	17207	16728	16262	15621	15397	398	2309	4211	4198	4187	4178	4171
	2.40	16541	16146	15736	15358	15018	398	2347	4261	4243	4226	4211	7199
	2.30	15969	15703	15418	15122	14626	405	4346	4298	4272	4249	4233	4222
	2.20	15482	15263	15020	14749	14300	418	4437	4311	4278	4262	4254	4248
	2.10	15062	14886	14681	14444	14103	424	2739	4302	4306	4303	4297	4291
	2.00	14708	14572	14406	14221	13917	13734	2212	4405	4389	4371	4355	4342
	1.90	14425	14314	14170	14013	13805	13691	2363	4387	4399	4393	4382	4369
	1.80	14213	14111	13989	13847	13640	13543	2421	4405	4398	4391	4382	4374
	1.70	14046	13952	13871	13793	13610	13625	4350	4442	4419	4404	4395	4389
	1.60	13863	13797	13729	13663	13591	13555	2508	4501	4469	4452	4446	4448
	1.50	13703	13649	13606	13574	13550	13565	2581	4575	4550	4553	4570	4591
	1.40	13538	13499	13506	13550	13685	13688	2212	4666	4732	4781	4826	4886
	1.30	13306	13296	13365	13494	13635	13838	4266	5022	5097	5161	5225	5282
	1.20	12951	13003	13197	13473	13783	14261	4794	5289	5456	5601	5727	5836
	1.10	12337	12573	13084	13670	14181	14638	5392	5746	5967	6197	6407	6582
	1.00	11143	11859	13014	14267	15145	15095	5909	6383	6808	7157	7420	7620

FIG. 2C

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