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(54) **ATTACHMENT MECHANISMS EMPLOYED TO ATTACH A REAR HOUSING SECTION TO A FIBER OPTIC HOUSING, AND RELATED ASSEMBLIES AND METHODS**

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(56) **References Cited**

U.S. PATENT DOCUMENTS

620,013 A 2/1899 Barnes
2,528,910 A 11/1950 Poe

(Continued)

FOREIGN PATENT DOCUMENTS

AU 2010270959 A1 2/2012
CA 2029592 A1 5/1992

(Continued)

OTHER PUBLICATIONS

International Search Report for PCT/US2012/023622 mailed Mar. 9, 2012, 4 pages.

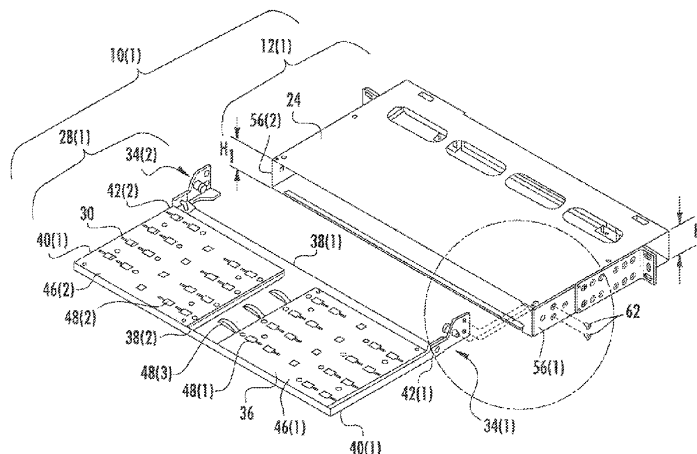
(Continued)

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(57) **ABSTRACT**

Attachment mechanisms configured to be employed to attach a rear housing section to a fiber optic housing, and related assemblies and methods are disclosed. The rear housing section and the fiber optic housing may be part of fiber optic equipment configured to support fiber optic connections of a fiber optic network. The attachment mechanism is configured to be attached and extend from the rear housing section of the fiber optic housing while maintaining the same installed U space of the housing. The attachment mechanism may include a spring plunger which may releasably maintain the rear housing section in a position to allow fasteners to removably attach the rear housing section to the fiber optic housing. In this manner, the rear housing section may be attached to and removed from the fiber optic housing in an efficient manner to minimize downtime for the fiber optic network.

20 Claims, 5 Drawing Sheets



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(56)

References Cited

U.S. PATENT DOCUMENTS

2,614,685	A	10/1952	Miller	5,071,220	A	12/1991	Ruello et al.
3,081,717	A	3/1963	Yurevich	5,073,042	A	12/1991	Mulholland et al.
3,175,873	A	3/1965	Blomquist et al.	5,074,635	A	12/1991	Justice et al.
3,212,192	A	10/1965	Bachmann et al.	5,076,688	A	12/1991	Bowen et al.
3,433,886	A	3/1969	Myers	5,080,459	A	1/1992	Wettengel et al.
3,494,306	A	2/1970	Aguilar	5,100,221	A	3/1992	Carney et al.
3,545,712	A	12/1970	Ellis	5,104,336	A	4/1992	Hatanaka et al.
3,568,263	A	3/1971	Meehan	5,125,060	A	6/1992	Edmundson
3,646,244	A	2/1972	Cole	5,127,082	A	6/1992	Below et al.
3,664,514	A	5/1972	Drake	5,127,851	A	7/1992	Hilbert et al.
3,683,238	A	8/1972	Olds et al.	5,129,030	A	7/1992	Petrunia
3,701,835	A	10/1972	Eisele et al.	5,129,607	A	7/1992	Satoh
3,880,396	A	4/1975	Freiberger et al.	5,133,039	A	7/1992	Dixit
3,906,592	A	9/1975	Sakasegawa et al.	5,138,678	A	8/1992	Briggs et al.
3,991,960	A	11/1976	Tanaka	5,138,688	A	8/1992	Debortoli
4,047,797	A	9/1977	Arnold et al.	5,142,598	A	8/1992	Tabone
4,059,872	A	11/1977	Delesandri	5,142,607	A	8/1992	Petrotta et al.
4,119,285	A	10/1978	Bisping et al.	5,150,277	A	9/1992	Bainbridge et al.
4,148,454	A	4/1979	Carlson et al.	D330,368	S	10/1992	Bourgeois et al.
4,239,316	A	12/1980	Spaulding	5,152,760	A	10/1992	Latina
4,244,638	A *	1/1981	Little et al. 439/471	5,153,910	A	10/1992	Mickelson et al.
4,285,486	A	8/1981	Von Osten et al.	5,157,749	A	10/1992	Briggs et al.
4,303,296	A	12/1981	Spaulding	5,167,001	A	11/1992	Debortoli et al.
4,354,731	A	10/1982	Mouissie	5,170,452	A	12/1992	Ott
4,457,482	A	7/1984	Kitagawa	5,189,723	A	2/1993	Johnson et al.
4,525,012	A	6/1985	Dunner	5,199,099	A	3/1993	Dalgoutte
4,540,222	A	9/1985	Burrell	5,204,929	A	4/1993	Machall et al.
4,561,615	A	12/1985	Medlin, Jr.	5,209,572	A	5/1993	Jordan
4,564,163	A	1/1986	Barnett	5,214,735	A	5/1993	Henneberger et al.
4,597,173	A	7/1986	Chino et al.	5,224,186	A	6/1993	Kishimoto et al.
4,611,875	A	9/1986	Clarke et al.	5,230,492	A	7/1993	Zwart et al.
4,635,886	A	1/1987	Santucci et al.	5,231,687	A	7/1993	Handley
4,645,292	A	2/1987	Sammueler	5,231,688	A	7/1993	Zimmer
4,657,340	A	4/1987	Tanaka et al.	5,233,674	A	8/1993	Vladic
4,681,288	A	7/1987	Nakamura	5,239,609	A	8/1993	Auteri
4,702,551	A	10/1987	Coulombe	5,243,679	A	9/1993	Sharrow et al.
4,711,518	A	12/1987	Shank et al.	5,253,320	A	10/1993	Takahashi et al.
4,736,100	A	4/1988	Vastagh	5,260,957	A	11/1993	Hakimi et al.
4,744,629	A	5/1988	Bertoglio et al.	5,261,633	A	11/1993	Mastro
4,747,020	A	5/1988	Brickley et al.	5,265,187	A	11/1993	Morin et al.
4,752,110	A	6/1988	Blanchet et al.	5,274,729	A	12/1993	King et al.
4,753,510	A	6/1988	Sezerman	5,274,731	A	12/1993	White
4,787,706	A	11/1988	Cannon, Jr. et al.	5,278,933	A	1/1994	Hunsinger et al.
4,792,203	A	12/1988	Nelson et al.	5,280,138	A	1/1994	Preston et al.
4,798,432	A	1/1989	Becker et al.	5,285,515	A	2/1994	Milanowski et al.
4,805,979	A	2/1989	Bossard et al.	5,291,570	A	3/1994	Filgas et al.
4,808,774	A	2/1989	Crane	5,315,679	A	5/1994	Baldwin et al.
4,824,193	A	4/1989	Maeda et al.	5,317,663	A	5/1994	Beard et al.
4,824,196	A	4/1989	Bylander	5,323,478	A	6/1994	Milanowski et al.
4,826,277	A	5/1989	Weber et al.	5,323,480	A	6/1994	Mullaney et al.
4,838,643	A	6/1989	Hodges et al.	5,329,520	A	7/1994	Richardson
4,840,449	A	6/1989	Ghandeharizadeh	5,333,193	A	7/1994	Cote et al.
4,865,280	A	9/1989	Wollar	5,333,221	A	7/1994	Briggs et al.
4,898,448	A	2/1990	Cooper	5,333,222	A	7/1994	Belenkiy et al.
4,900,123	A	2/1990	Barlow et al.	5,337,400	A	8/1994	Morin et al.
4,911,662	A	3/1990	Debortoli et al.	5,339,379	A	8/1994	Kutsch et al.
4,948,220	A	8/1990	Violo et al.	5,347,603	A	9/1994	Belenkiy et al.
4,949,376	A	8/1990	Nieves et al.	5,353,367	A	10/1994	Czosnowski et al.
4,971,421	A	11/1990	Ori	5,359,688	A	10/1994	Underwood
4,986,625	A	1/1991	Yamada et al.	5,363,466	A	11/1994	Milanowski et al.
4,988,831	A *	1/1991	Wilson et al. 174/662	5,363,467	A	11/1994	Keith
4,991,928	A	2/1991	Zimmer	5,366,388	A	11/1994	Freeman et al.
4,995,688	A	2/1991	Anton et al.	5,367,598	A	11/1994	Devenish, III et al.
5,001,602	A	3/1991	Suffi et al.	5,373,421	A	12/1994	Detsikas et al.
5,005,941	A	4/1991	Barlow et al.	5,383,051	A	1/1995	Delrosso et al.
5,017,211	A	5/1991	Wenger et al.	5,390,272	A	2/1995	Repta et al.
5,023,646	A	6/1991	Ishida et al.	5,398,295	A	3/1995	Chang et al.
5,024,498	A	6/1991	Becker et al.	5,398,820	A	3/1995	Kiss
5,028,114	A	7/1991	Krausse et al.	5,399,814	A	3/1995	Staber et al.
5,037,175	A	8/1991	Weber	5,401,193	A	3/1995	Lo Cicero et al.
5,048,918	A	9/1991	Daems et al.	5,402,515	A	3/1995	Vidacovich et al.
5,060,897	A	10/1991	Thalenfeld	5,408,557	A	4/1995	Hsu
5,066,149	A	11/1991	Wheeler et al.	RE34,955	E	5/1995	Anton et al.
5,067,784	A	11/1991	Debortoli et al.	5,412,751	A	5/1995	Siemon et al.
5,071,211	A	12/1991	Debortoli et al.	5,416,837	A	5/1995	Cote et al.
				5,418,874	A	5/1995	Carlisle et al.
				5,420,956	A	5/1995	Grugel et al.
				5,420,958	A	5/1995	Henson et al.
				5,421,532	A	6/1995	Richter

(56)

References Cited

U.S. PATENT DOCUMENTS

5,438,641 A	8/1995	Malacarne	5,793,920 A	8/1998	Wilkins et al.
5,442,725 A	8/1995	Peng	5,793,921 A	8/1998	Wilkins et al.
5,442,726 A	8/1995	Howard et al.	5,796,908 A	8/1998	Vicory
5,443,232 A	8/1995	Kesinger et al.	5,806,687 A	9/1998	Ballesteros et al.
5,444,804 A	8/1995	Yui et al.	5,823,646 A	10/1998	Arizpe et al.
5,448,015 A	9/1995	Jamet et al.	5,825,955 A	10/1998	Ernst et al.
5,450,518 A	9/1995	Burek et al.	5,825,961 A	10/1998	Wilkins et al.
5,458,019 A	10/1995	Trevino	5,828,807 A	10/1998	Tucker et al.
5,471,555 A	11/1995	Braga et al.	5,832,162 A	11/1998	Sarbell
5,479,505 A	12/1995	Butler et al.	5,835,657 A	11/1998	Suarez et al.
5,481,634 A	1/1996	Anderson et al.	5,835,658 A	11/1998	Smith
5,481,939 A	1/1996	Bernardini	5,862,290 A	1/1999	Burek et al.
5,490,229 A	2/1996	Ghandeharizadeh et al.	5,870,519 A	2/1999	Jenkins et al.
5,495,549 A	2/1996	Schneider et al.	5,874,733 A	2/1999	Silver et al.
5,497,416 A	3/1996	Butler, III et al.	5,877,565 A	3/1999	Hollenbach et al.
5,497,444 A	3/1996	Wheeler	5,880,864 A	3/1999	Williams et al.
5,511,144 A	4/1996	Hawkins et al.	5,881,200 A	3/1999	Burt
5,511,798 A	4/1996	Kawamoto et al.	5,883,995 A	3/1999	Lu
5,519,804 A	5/1996	Burek et al.	5,884,003 A	3/1999	Cloud et al.
5,530,786 A	6/1996	Radliff et al.	5,887,095 A	3/1999	Nagase et al.
5,535,970 A	7/1996	Gobbi	5,887,106 A	3/1999	Cheeseman et al.
5,538,213 A	7/1996	Brown	5,892,877 A	4/1999	Meyerhoefer
5,542,015 A	7/1996	Hultermans	5,894,540 A	4/1999	Drawing
5,546,495 A	8/1996	Bruckner et al.	5,901,220 A	5/1999	Garver et al.
5,548,641 A	8/1996	Butler et al.	5,903,693 A	5/1999	Brown
5,553,183 A	9/1996	Bechamps	5,906,342 A	5/1999	Kraus
5,553,186 A	9/1996	Allen	5,909,298 A	6/1999	Shimada et al.
5,563,971 A	10/1996	Abendschein	5,913,006 A	6/1999	Summach
5,572,617 A	11/1996	Bernhardt et al.	5,914,976 A	6/1999	Jayaraman et al.
5,575,680 A	11/1996	Suffi	5,915,055 A	6/1999	Bennett et al.
5,577,151 A	11/1996	Hoffer	5,923,804 A	7/1999	Rosson
5,590,234 A	12/1996	Pulido	5,930,425 A	7/1999	Abel et al.
5,595,507 A	1/1997	Braun et al.	5,933,557 A	8/1999	Ott
5,596,670 A	1/1997	Debortoli et al.	5,940,563 A	8/1999	Kobayashi et al.
5,600,020 A	2/1997	Wehle et al.	5,943,460 A	8/1999	Mead et al.
5,602,954 A	2/1997	Nolf et al.	5,945,633 A	8/1999	Ott et al.
5,608,606 A	3/1997	Blaney	5,946,440 A	8/1999	Puetz
5,613,030 A	3/1997	Hoffer et al.	5,949,946 A	9/1999	Debortoli et al.
5,617,501 A	4/1997	Miller et al.	5,953,962 A	9/1999	Hewson
5,638,474 A	6/1997	Lampert et al.	5,956,439 A	9/1999	Pimpinella
5,640,476 A	6/1997	Womack et al.	5,956,444 A	9/1999	Duda et al.
5,640,482 A	6/1997	Barry et al.	5,956,449 A	9/1999	Otani et al.
5,647,043 A	7/1997	Anderson et al.	5,966,492 A	10/1999	Bechamps et al.
5,647,045 A	7/1997	Robinson et al.	5,969,294 A	10/1999	Eberle et al.
5,650,334 A	7/1997	Zuk et al.	5,975,769 A	11/1999	Larson et al.
5,668,910 A	9/1997	Arnett	5,978,540 A	11/1999	Bechamps et al.
5,668,911 A	9/1997	Debortoli	5,980,303 A	11/1999	Lee et al.
5,671,273 A	9/1997	Lanquist	5,987,203 A	11/1999	Abel et al.
5,689,605 A	11/1997	Cobb et al.	5,993,071 A	11/1999	Hultermans
5,689,607 A	11/1997	Vincent et al.	5,995,700 A	11/1999	Burek et al.
5,692,079 A	11/1997	Iso	5,999,393 A	12/1999	Brower
5,694,511 A	12/1997	Pimpinella et al.	6,001,831 A	12/1999	Papenfuhs et al.
5,701,380 A	12/1997	Larson et al.	6,009,224 A	12/1999	Allen
5,704,573 A	1/1998	de Beers et al.	6,009,225 A	12/1999	Ray et al.
5,708,742 A	1/1998	Beun et al.	6,011,831 A	1/2000	Nieves et al.
5,708,751 A	1/1998	Mattei	6,027,252 A	2/2000	Erdman et al.
5,710,851 A	1/1998	Walter et al.	6,027,352 A	2/2000	Byrne
5,717,810 A	2/1998	Wheeler	6,041,042 A	3/2000	Bussiere
5,734,776 A	3/1998	Puetz	6,044,193 A	3/2000	Szentesi et al.
5,740,300 A	4/1998	Hodge	6,049,963 A	4/2000	Boe
5,742,982 A	4/1998	Dodd et al.	6,058,235 A	5/2000	Hiramatsu et al.
5,751,874 A	5/1998	Chudoba et al.	6,061,492 A	5/2000	Strause et al.
5,751,882 A	5/1998	Daems et al.	6,078,661 A	6/2000	Arnett et al.
5,754,724 A	5/1998	Peterson et al.	6,079,881 A	6/2000	Roth
5,758,003 A	5/1998	Wheeler et al.	6,088,497 A	7/2000	Phillips et al.
5,758,004 A	5/1998	Alarcon et al.	6,118,075 A	9/2000	Baker et al.
5,761,026 A	6/1998	Robinson et al.	6,127,627 A	10/2000	Daoud
5,765,698 A	6/1998	Bullivant	6,130,983 A	10/2000	Cheng
5,769,908 A	6/1998	Koppelman	6,134,370 A	10/2000	Childers et al.
5,774,612 A	6/1998	Belenkiy et al.	6,141,222 A	10/2000	Toor et al.
5,778,122 A	7/1998	Giebel et al.	6,149,313 A	11/2000	Giebel et al.
5,778,130 A	7/1998	Walters et al.	6,149,315 A	11/2000	Stephenson
5,781,686 A	7/1998	Robinson et al.	6,151,432 A	11/2000	Nakajima et al.
5,788,087 A	8/1998	Orlando	6,160,946 A	12/2000	Thompson et al.
5,790,741 A	8/1998	Vincent et al.	6,170,784 B1	1/2001	MacDonald et al.
			6,172,782 B1	1/2001	Kobayashi
			6,175,079 B1	1/2001	Johnston et al.
			6,181,861 B1	1/2001	Wenski et al.
			6,188,687 B1	2/2001	Mussman et al.

(56)

References Cited

U.S. PATENT DOCUMENTS

6,188,825 B1	2/2001	Bandy et al.	6,466,724 B1	10/2002	Glover et al.
6,192,180 B1	2/2001	Kim et al.	6,469,905 B1	10/2002	Hwang
6,200,170 B1	3/2001	Amberg et al.	D466,087 S	11/2002	Cuny et al.
6,201,919 B1	3/2001	Puetz et al.	6,478,472 B1	11/2002	Anderson et al.
6,201,920 B1	3/2001	Noble et al.	6,480,487 B1	11/2002	Wegleitner et al.
6,208,796 B1	3/2001	Williams	6,480,660 B1	11/2002	Reitmeier et al.
6,212,324 B1	4/2001	Lin et al.	6,483,977 B2	11/2002	Batthey et al.
6,215,938 B1	4/2001	Reitmeier et al.	6,484,958 B1	11/2002	Xue et al.
6,216,987 B1	4/2001	Fukuo	6,494,550 B1	12/2002	Chen et al.
6,227,717 B1	5/2001	Ott et al.	6,496,640 B1	12/2002	Harvey et al.
6,229,948 B1	5/2001	Blee et al.	6,504,988 B1	1/2003	Trebesch et al.
6,234,683 B1	5/2001	Waldron et al.	6,507,980 B2	1/2003	Bremicker
6,234,685 B1	5/2001	Carlisle et al.	6,510,274 B1	1/2003	Wu et al.
6,236,795 B1	5/2001	Rodgers	6,532,332 B2	3/2003	Solheid et al.
6,240,229 B1	5/2001	Roth	6,533,472 B1	3/2003	Dinh et al.
6,243,522 B1	6/2001	Allan et al.	6,535,397 B2	3/2003	Clark et al.
6,245,998 B1	6/2001	Curry et al.	6,539,147 B1	3/2003	Mahony
6,247,851 B1	6/2001	Ichihara	6,539,160 B2	3/2003	Batthey et al.
6,250,816 B1	6/2001	Johnston et al.	6,542,688 B1	4/2003	Batthey et al.
6,259,850 B1	7/2001	Crosby, Jr. et al.	6,544,075 B1	4/2003	Liao
6,263,141 B1	7/2001	Smith	6,550,977 B2	4/2003	Hizuka
6,265,680 B1	7/2001	Robertson	6,554,485 B1	4/2003	Beatty et al.
6,269,212 B1	7/2001	Schiattone	6,560,334 B1	5/2003	Mullaney et al.
6,273,532 B1	8/2001	Chen et al.	6,567,601 B2	5/2003	Daoud et al.
6,275,641 B1	8/2001	Daoud	6,568,542 B1 *	5/2003	Chen 211/26
6,278,829 B1	8/2001	BuAbbud et al.	6,571,048 B1	5/2003	Bechamps et al.
6,278,831 B1	8/2001	Henderson et al.	6,577,595 B1	6/2003	Counterterm
D448,005 S	9/2001	Klein, Jr. et al.	6,577,801 B2	6/2003	Broderick et al.
6,289,618 B1	9/2001	Kump et al.	6,579,014 B2	6/2003	Melton et al.
6,292,614 B1	9/2001	Smith et al.	6,584,267 B1	6/2003	Caveney et al.
6,301,424 B1	10/2001	Hwang	6,585,423 B1	7/2003	Vergeest
6,305,848 B1	10/2001	Gregory	6,587,630 B2	7/2003	Spence et al.
6,307,997 B1	10/2001	Walters et al.	6,588,938 B1	7/2003	Lampert et al.
6,318,824 B1	11/2001	LaGrotta et al.	6,591,051 B2	7/2003	Solheid et al.
6,321,017 B1	11/2001	Janus et al.	6,591,053 B2	7/2003	Fritz
6,322,279 B1	11/2001	Yamamoto et al.	6,592,266 B1	7/2003	Hankins et al.
6,324,575 B1	11/2001	Jain et al.	6,597,670 B1	7/2003	Tweedy et al.
6,325,549 B1	12/2001	Shevchuk	6,600,106 B2 *	7/2003	Standish et al. 174/68.3
6,327,059 B1	12/2001	Bhalla et al.	6,600,866 B2	7/2003	Gatica et al.
RE37,489 E	1/2002	Anton et al.	6,601,997 B2	8/2003	Ngo
6,343,313 B1	1/2002	Salesky et al.	6,612,515 B1	9/2003	Tinucci et al.
6,344,615 B1	2/2002	Nolf et al.	6,612,874 B1	9/2003	Stout et al.
6,347,888 B1	2/2002	Puetz	6,614,978 B1	9/2003	Caveney
6,353,696 B1	3/2002	Gordon et al.	6,614,980 B1	9/2003	Mahony
6,353,697 B1	3/2002	Daoud	6,621,975 B2	9/2003	Laporte et al.
6,357,712 B1	3/2002	Lu	6,622,873 B2	9/2003	Hegrenes et al.
6,359,228 B1	3/2002	Strause et al.	6,624,389 B1	9/2003	Cox
6,363,198 B1	3/2002	Braga et al.	6,625,374 B2	9/2003	Holman et al.
6,363,200 B1	3/2002	Thompson et al.	6,625,375 B1	9/2003	Mahony
6,370,309 B1	4/2002	Daoud	6,631,237 B2	10/2003	Knudsen et al.
6,371,419 B1	4/2002	Ohnuki	6,640,042 B2	10/2003	Araki et al.
6,375,129 B2	4/2002	Koziol	RE38,311 E	11/2003	Wheeler
6,377,218 B1	4/2002	Nelson et al.	6,644,863 B1	11/2003	Azami et al.
6,379,052 B1	4/2002	De Jong et al.	6,647,197 B1	11/2003	Marrs et al.
6,381,642 B1	4/2002	O'Donnell et al.	6,648,520 B2	11/2003	McDonald et al.
6,385,374 B2	5/2002	Kropp	6,654,536 B2	11/2003	Batthey et al.
6,385,381 B1	5/2002	Janus et al.	6,668,127 B1	12/2003	Mahony
6,389,214 B1	5/2002	Smith et al.	6,669,149 B2	12/2003	Akizuki
6,397,166 B1	5/2002	Leung et al.	6,677,520 B1	1/2004	Kim et al.
6,398,149 B1	6/2002	Hines et al.	6,679,604 B1	1/2004	Bove et al.
6,406,314 B1	6/2002	Byrne	6,687,450 B1	2/2004	Kempeneers et al.
6,410,850 B1	6/2002	Abel et al.	6,693,552 B1	2/2004	Herzig et al.
6,411,767 B1	6/2002	Burrous et al.	6,695,620 B1	2/2004	Huang
6,412,986 B1	7/2002	Ngo et al.	6,701,056 B2	3/2004	Burek et al.
6,418,262 B1	7/2002	Puetz et al.	6,710,366 B1	3/2004	Lee et al.
6,419,519 B1	7/2002	Young	6,715,619 B2	4/2004	Kim et al.
6,424,781 B1	7/2002	Puetz et al.	6,719,149 B2	4/2004	Tomino
6,425,694 B1	7/2002	Szilagyi et al.	6,721,482 B1	4/2004	Glynn
6,427,045 B1	7/2002	Matthes et al.	6,741,784 B1	5/2004	Guan
6,431,762 B1	8/2002	Taira et al.	6,741,785 B2	5/2004	Barthel et al.
6,434,313 B1	8/2002	Clapp, Jr. et al.	6,746,037 B1	6/2004	Kaplenski et al.
6,438,310 B1	8/2002	Lance et al.	6,748,154 B2	6/2004	O'Leary et al.
6,452,925 B1	9/2002	Sistanizadeh et al.	6,748,155 B2	6/2004	Kim et al.
6,456,773 B1	9/2002	Keys	6,758,600 B2	7/2004	Del Grosso et al.
6,464,402 B1	10/2002	Andrews et al.	6,768,860 B2	7/2004	Liberty
			6,771,861 B2	8/2004	Wagner et al.
			6,773,297 B2	8/2004	Komiya
			6,778,525 B1	8/2004	Baum et al.
			6,778,752 B2	8/2004	Laporte et al.

(56)

References Cited

U.S. PATENT DOCUMENTS

6,786,647 B1	9/2004	Hinds et al.	7,094,095 B1	8/2006	Caveney
6,786,743 B2	9/2004	Huang	7,097,047 B2	8/2006	Lee et al.
6,786,896 B1	9/2004	Madhani et al.	7,101,093 B2	9/2006	Hsiao et al.
6,788,871 B2	9/2004	Taylor	7,102,884 B2	9/2006	Mertesdorf et al.
6,792,190 B2	9/2004	Xin et al.	7,103,255 B2	9/2006	Reagan et al.
6,798,751 B1	9/2004	Voit et al.	7,110,654 B2	9/2006	Dillat
6,804,447 B2	10/2004	Smith et al.	7,111,990 B2	9/2006	Melton et al.
6,810,194 B2	10/2004	Griffiths et al.	7,113,679 B2	9/2006	Melton et al.
6,813,412 B2	11/2004	Lin	7,113,686 B2	9/2006	Bellekens et al.
6,816,660 B2	11/2004	Nashimoto	7,113,687 B2	9/2006	Womack et al.
6,818,834 B1 *	11/2004	Lin 174/135	7,116,491 B1	10/2006	Willey et al.
6,819,856 B2	11/2004	Dagley et al.	7,116,883 B2	10/2006	Kline et al.
6,819,857 B2	11/2004	Douglas et al.	7,118,281 B2	10/2006	Chiu et al.
6,822,874 B1	11/2004	Marler	7,118,405 B2	10/2006	Peng
6,826,174 B1	11/2004	Erekson et al.	7,120,347 B2	10/2006	Blackwell, Jr. et al.
6,826,346 B2	11/2004	Sloan et al.	7,120,348 B2	10/2006	Trebesch et al.
6,826,631 B2	11/2004	Webb	7,120,349 B2	10/2006	Elliott
6,830,489 B2	12/2004	Aoyama	7,127,143 B2	10/2006	Elkins, II et al.
6,839,428 B2	1/2005	Brower et al.	7,128,471 B2	10/2006	Wilson
6,839,438 B1	1/2005	Riegelsberger et al.	7,136,555 B2	11/2006	Theuerkorn et al.
6,840,815 B2	1/2005	Musolf et al.	7,139,462 B1	11/2006	Richtman
6,845,207 B2	1/2005	Schray	7,140,903 B2	11/2006	Pullizzi et al.
6,847,614 B2	1/2005	Banker et al.	7,147,383 B2	12/2006	Sullivan
6,848,862 B1	2/2005	Schlig	7,170,466 B2	1/2007	Janoschka
6,850,685 B2	2/2005	Tinucci et al.	7,171,099 B2	1/2007	Barnes et al.
6,853,637 B1	2/2005	Norrell et al.	7,171,121 B1	1/2007	Skarica et al.
6,854,894 B1	2/2005	Yunker et al.	7,181,142 B1	2/2007	Xu et al.
6,856,334 B1	2/2005	Fukui	7,186,134 B2	3/2007	Togami et al.
6,856,505 B1	2/2005	Venegas et al.	7,193,783 B2	3/2007	Willey et al.
6,863,444 B2	3/2005	Anderson et al.	7,194,181 B2	3/2007	Holmberg et al.
6,865,331 B2	3/2005	Mertesdorf	7,195,521 B2	3/2007	Musolf et al.
6,865,334 B2	3/2005	Cooke et al.	7,200,314 B2	4/2007	Womack et al.
6,866,541 B2	3/2005	Barker et al.	7,200,316 B2	4/2007	Giraud et al.
6,868,216 B1	3/2005	Gehrke	7,201,595 B1	4/2007	Morello
6,869,227 B2	3/2005	Del Grosso et al.	7,217,040 B2	5/2007	Crews et al.
6,870,734 B2	3/2005	Mertesdorf et al.	7,218,526 B2	5/2007	Mayer
6,870,997 B2	3/2005	Cooke et al.	7,220,065 B2	5/2007	Han et al.
6,879,545 B2	4/2005	Cooke et al.	7,221,832 B2	5/2007	Tinucci
6,915,058 B2	7/2005	Pons	7,228,036 B2	6/2007	Elkins, II et al.
6,920,273 B2	7/2005	Knudsen	7,228,047 B1	6/2007	Szilagyi et al.
6,920,274 B2	7/2005	Rapp et al.	7,231,125 B2	6/2007	Douglas et al.
6,923,406 B2	8/2005	Akizuki	7,234,878 B2	6/2007	Yamauchi et al.
6,925,241 B2	8/2005	Bohle et al.	7,236,677 B2	6/2007	Escoto et al.
6,934,451 B2	8/2005	Cooke et al.	7,239,789 B2	7/2007	Grubish et al.
6,934,456 B2	8/2005	Ferris et al.	7,245,809 B1	7/2007	Gniadek et al.
6,935,598 B2	8/2005	Sono et al.	7,259,325 B2	8/2007	Pincu et al.
6,937,807 B2	8/2005	Franklin et al.	7,266,283 B2	9/2007	Kline et al.
6,944,383 B1	9/2005	Herzog et al.	7,270,485 B1	9/2007	Robinson et al.
6,944,389 B2	9/2005	Giraud et al.	7,272,291 B2	9/2007	Bayazit et al.
6,945,701 B2	9/2005	Trezza et al.	7,274,852 B1	9/2007	Smrha et al.
6,952,530 B2	10/2005	Helvajian et al.	7,284,785 B2	10/2007	Gotou et al.
6,963,690 B1	11/2005	Kassal et al.	7,287,913 B2	10/2007	Keenum et al.
6,968,107 B2	11/2005	Belardi et al.	7,289,731 B2	10/2007	Thingulstad
6,968,111 B2	11/2005	Trebesch et al.	7,292,769 B2	11/2007	Watanabe et al.
6,985,665 B2	1/2006	Baechtle	7,298,950 B2	11/2007	Frohlich
6,993,237 B2	1/2006	Cooke et al.	7,300,216 B2	11/2007	Morse et al.
7,000,784 B2	2/2006	Canty et al.	7,300,308 B2	11/2007	Laursen et al.
7,005,582 B2	2/2006	Muller et al.	7,302,149 B2	11/2007	Swam et al.
7,006,748 B2	2/2006	Dagley et al.	7,302,153 B2	11/2007	Thom
7,007,296 B2	2/2006	Rakib	7,302,154 B2	11/2007	Trebesch et al.
7,025,275 B2	4/2006	Huang et al.	7,308,184 B2	12/2007	Barnes et al.
7,027,695 B2	4/2006	Cooke et al.	7,310,471 B2	12/2007	Bayazit et al.
7,027,706 B2	4/2006	Diaz et al.	7,310,472 B2	12/2007	Haberman
7,031,588 B2	4/2006	Cowley et al.	7,315,681 B2	1/2008	Kewitsch
7,035,510 B2	4/2006	Zimmel et al.	7,325,975 B2	2/2008	Yamada et al.
7,038,137 B2	5/2006	Grubish et al.	7,330,624 B2	2/2008	Isenhour et al.
7,048,447 B1	5/2006	Patel et al.	7,330,625 B2	2/2008	Barth
7,054,513 B2	5/2006	Herz et al.	7,330,626 B2	2/2008	Kowalczyk et al.
7,066,748 B2	6/2006	Bricaud et al.	7,330,629 B2	2/2008	Cooke et al.
7,068,907 B2	6/2006	Schray	7,331,718 B2	2/2008	Yazaki et al.
7,070,459 B2	7/2006	Denovich et al.	7,340,145 B2	3/2008	Allen
7,077,710 B2	7/2006	Haggay et al.	7,349,615 B2	3/2008	Frazier et al.
7,079,744 B2	7/2006	Douglas et al.	7,352,946 B2	4/2008	Heller et al.
7,090,406 B2	8/2006	Melton et al.	7,352,947 B2 *	4/2008	Phung et al. 385/135
7,090,407 B2	8/2006	Melton et al.	7,373,071 B2	5/2008	Douglas et al.
			7,376,321 B2	5/2008	Bolster et al.
			7,376,323 B2	5/2008	Zimmel
			7,391,952 B1	6/2008	Ugolini et al.
			7,397,996 B2	7/2008	Herzog et al.

(56)

References Cited

U.S. PATENT DOCUMENTS

7,400,813 B2	7/2008	Zimmel	7,751,675 B2	7/2010	Holmberg et al.
7,404,736 B2	7/2008	Herbst et al.	7,756,371 B1	7/2010	Burnham et al.
7,409,137 B2	8/2008	Barnes	7,756,382 B2	7/2010	Saravanos et al.
7,414,198 B2	8/2008	Stansbie et al.	7,760,984 B2	7/2010	Solheid et al.
7,417,188 B2	8/2008	McNutt et al.	7,764,858 B2	7/2010	Bayazit et al.
7,418,182 B2	8/2008	Krampotich	7,764,859 B2	7/2010	Krampotich et al.
7,418,184 B1	8/2008	Gonzales et al.	7,769,266 B2	8/2010	Morris
7,421,182 B2	9/2008	Bayazit et al.	7,805,044 B2	9/2010	Reagan et al.
7,428,363 B2	9/2008	Leon et al.	7,809,232 B2	10/2010	Reagan et al.
7,435,090 B1	10/2008	Schriefer et al.	7,809,235 B2	10/2010	Reagan et al.
7,437,049 B2	10/2008	Krampotich	7,811,136 B1	10/2010	Hsieh et al.
7,439,453 B2	10/2008	Murano et al.	7,822,310 B2	10/2010	Castonguay et al.
7,454,113 B2	11/2008	Barnes	7,837,495 B2	11/2010	Baldwin et al.
7,460,757 B2	12/2008	Hoehe et al.	7,850,372 B2	12/2010	Nishimura et al.
7,460,758 B2	12/2008	Xin	7,853,112 B2	12/2010	Zimmel et al.
7,461,981 B2	12/2008	Yow, Jr. et al.	7,856,166 B2	12/2010	Biribuze et al.
7,462,779 B2	12/2008	Caveney et al.	7,862,369 B2	1/2011	Gimenes et al.
7,463,810 B2	12/2008	Bayazit et al.	7,869,685 B2	1/2011	Hendrickson et al.
7,463,811 B2	12/2008	Trebesch et al.	7,876,580 B2 *	1/2011	Mayer 361/826
7,469,090 B2	12/2008	Ferris et al.	7,899,298 B2	3/2011	Cox et al.
7,471,867 B2	12/2008	Vogel et al.	7,914,332 B2	3/2011	Song et al.
7,474,828 B2	1/2009	Leon et al.	7,942,589 B2	5/2011	Yazaki et al.
7,477,824 B2	1/2009	Reagan et al.	7,945,135 B2	5/2011	Cooke et al.
7,477,826 B2	1/2009	Mullaney et al.	7,945,136 B2	5/2011	Cooke et al.
7,480,438 B2	1/2009	Douglas et al.	7,945,138 B2	5/2011	Hill et al.
7,488,205 B2	2/2009	Spisany et al.	7,970,250 B2	6/2011	Morris
7,493,002 B2	2/2009	Coburn et al.	7,991,252 B2	8/2011	Cheng et al.
7,496,269 B1	2/2009	Lee	8,009,959 B2	8/2011	Barnes et al.
7,499,622 B2	3/2009	Castonguay et al.	8,014,171 B2	9/2011	Kelly et al.
7,499,623 B2	3/2009	Barnes et al.	8,014,646 B2	9/2011	Keith et al.
7,507,111 B2	3/2009	Togami et al.	8,020,813 B1	9/2011	Clark et al.
7,509,015 B2	3/2009	Murano	8,059,932 B2	11/2011	Hill et al.
7,509,016 B2	3/2009	Smith et al.	8,093,499 B2 *	1/2012	Hoffer et al. 174/72 A
7,510,421 B2 *	3/2009	Fransen et al. 439/449	8,107,785 B2	1/2012	Berglund et al.
7,522,804 B2	4/2009	Araki et al.	8,131,126 B2	3/2012	Kowalczyk et al.
7,523,898 B1	4/2009	Barry et al.	8,184,938 B2	5/2012	Cooke et al.
7,526,171 B2	4/2009	Caveney et al.	8,206,043 B2	6/2012	Thirugnanam et al.
7,526,172 B2	4/2009	Gniadek et al.	8,206,058 B2	6/2012	Vrondran et al.
7,526,174 B2	4/2009	Leon et al.	8,220,881 B2	7/2012	Keith
7,529,458 B2	5/2009	Spisany et al.	8,226,305 B2	7/2012	Thirugnanam et al.
7,534,958 B2	5/2009	McNutt et al.	8,249,410 B2	8/2012	Andrus et al.
7,536,075 B2	5/2009	Zimmel	8,251,591 B2	8/2012	Barnes et al.
7,540,666 B2	6/2009	Luther et al.	8,270,798 B2	9/2012	Dagley et al.
7,542,645 B1	6/2009	Hua et al.	8,280,216 B2	10/2012	Cooke et al.
7,544,085 B2	6/2009	Baldwin et al.	8,285,104 B2	10/2012	Davis et al.
7,552,899 B2	6/2009	Chen et al.	8,301,004 B2	10/2012	Cooke et al.
7,555,193 B2	6/2009	Rapp et al.	8,331,752 B2	12/2012	Biribuze et al.
7,558,458 B2	7/2009	Gronvall et al.	8,353,494 B2	1/2013	Peng et al.
7,565,051 B2	7/2009	Vongseng	8,369,679 B2	2/2013	Wakileh et al.
7,567,744 B2	7/2009	Krampotich et al.	8,391,666 B2	3/2013	Hetzer et al.
7,570,860 B2	8/2009	Smrha et al.	8,472,773 B2	6/2013	de Jong
7,570,861 B2	8/2009	Smrha et al.	8,491,331 B2	7/2013	Follingstad
7,577,331 B2	8/2009	Laurisch et al.	8,528,872 B2	9/2013	Mattlin et al.
7,596,293 B2	9/2009	Isenhour et al.	8,537,477 B2	9/2013	Shioda
7,603,020 B1	10/2009	Wakileh et al.	8,538,226 B2 *	9/2013	Makrides-Saravanos et al. 385/135
7,607,938 B2	10/2009	Clark et al.	8,559,783 B2	10/2013	Campos et al.
7,609,967 B2	10/2009	Hochbaum et al.	2001/0010741 A1	8/2001	Hizuka
7,613,377 B2	11/2009	Gonzales et al.	2001/0029125 A1	10/2001	Morita et al.
7,614,903 B1	11/2009	Huang	2002/0010818 A1	1/2002	Wei et al.
7,620,287 B2	11/2009	Appenzeller et al.	2002/0012353 A1	1/2002	Gerszberg et al.
7,641,398 B2	1/2010	O'Riorden et al.	2002/0014571 A1	2/2002	Thompson
7,668,430 B2	2/2010	McClellan et al.	2002/0034290 A1	3/2002	Pershan
7,668,433 B2	2/2010	Bayazit et al.	2002/0037139 A1	3/2002	Asao et al.
7,672,561 B1	3/2010	Keith et al.	2002/0064364 A1	5/2002	Batthey et al.
7,676,135 B2	3/2010	Chen	2002/0131730 A1	9/2002	Keeble et al.
7,689,079 B2	3/2010	Burnham et al.	2002/0136519 A1	9/2002	Tinuucci et al.
7,694,926 B2	4/2010	Allen et al.	2002/0141724 A1	10/2002	Ogawa et al.
7,697,811 B2	4/2010	Murano et al.	2002/0150372 A1	10/2002	Schray
7,706,294 B2	4/2010	Natarajan et al.	2002/0172467 A1	11/2002	Anderson et al.
7,715,125 B2	5/2010	Wiley	2002/0180163 A1	12/2002	Muller et al.
7,715,683 B2	5/2010	Kowalczyk et al.	2002/0181918 A1	12/2002	Spence et al.
7,734,138 B2	6/2010	Bloodworth et al.	2002/0181922 A1	12/2002	Xin et al.
7,740,409 B2	6/2010	Bolton et al.	2002/0191939 A1	12/2002	Daoud et al.
7,743,495 B2	6/2010	Mori et al.	2002/0194596 A1	12/2002	Srivastava
7,751,674 B2	7/2010	Hill	2003/0002802 A1	1/2003	Trezza et al.
			2003/0007743 A1	1/2003	Asada
			2003/0007767 A1	1/2003	Douglas et al.
			2003/0011855 A1	1/2003	Fujiwara

(56)		References Cited	
		U.S. PATENT DOCUMENTS	
2003/0021539	A1	1/2003	Kwon et al.
2003/0036748	A1	2/2003	Cooper et al.
2003/0051026	A1	3/2003	Carter et al.
2003/0066998	A1	4/2003	Lee
2003/0086675	A1	5/2003	Wu et al.
2003/0095753	A1	5/2003	Wada et al.
2003/0147604	A1	8/2003	Tapia et al.
2003/0156552	A1	8/2003	Banker et al.
2003/0174996	A1	9/2003	Henschel et al.
2003/0180004	A1	9/2003	Cox et al.
2003/0180012	A1	9/2003	Deane et al.
2003/0183413	A1	10/2003	Kato
2003/0199201	A1	10/2003	Mullaney et al.
2003/0210882	A1	11/2003	Barthel et al.
2003/0223723	A1	12/2003	Massey et al.
2003/0223725	A1	12/2003	Laporte et al.
2003/0235387	A1	12/2003	Dufour
2004/0001717	A1	1/2004	Bennett et al.
2004/0013389	A1	1/2004	Taylor
2004/0013390	A1	1/2004	Kim et al.
2004/0022494	A1	2/2004	Liddle et al.
2004/0024934	A1	2/2004	Webb
2004/0067036	A1	4/2004	Clark et al.
2004/0074852	A1	4/2004	Knudsen et al.
2004/0086238	A1	5/2004	Finona et al.
2004/0086252	A1	5/2004	Smith et al.
2004/0120679	A1	6/2004	Vincent et al.
2004/0147159	A1	7/2004	Urban et al.
2004/0151465	A1	8/2004	Krampotich et al.
2004/0175090	A1	9/2004	Vastmans et al.
2004/0192115	A1	9/2004	Bugg
2004/0196841	A1	10/2004	Tudor et al.
2004/0208459	A1	10/2004	Mizue et al.
2004/0228598	A1	11/2004	Allen et al.
2004/0240827	A1	12/2004	Daoud et al.
2004/0240882	A1	12/2004	Lipski et al.
2004/0264873	A1	12/2004	Smith et al.
2005/0002633	A1	1/2005	Solheid et al.
2005/0008131	A1	1/2005	Cook
2005/0026497	A1	2/2005	Holliday
2005/0036749	A1	2/2005	Vogel et al.
2005/0067358	A1	3/2005	Lee et al.
2005/0069248	A1	3/2005	Jasti et al.
2005/0074990	A1	4/2005	Shearman et al.
2005/0076149	A1	4/2005	McKown et al.
2005/0083959	A1	4/2005	Binder
2005/0107086	A1	5/2005	Tell et al.
2005/0111809	A1	5/2005	Giraud et al.
2005/0123261	A1	6/2005	Bellekens et al.
2005/0129379	A1	6/2005	Reagan et al.
2005/0178573	A1	8/2005	James
2005/0201073	A1	9/2005	Pincu et al.
2005/0232566	A1	10/2005	Rapp et al.
2005/0233647	A1	10/2005	Denovich et al.
2005/0254757	A1	11/2005	Ferretti, III et al.
2005/0281526	A1	12/2005	Vongseng et al.
2005/0285493	A1	12/2005	Hu et al.
2006/0007562	A1	1/2006	Willey et al.
2006/0018448	A1	1/2006	Stevens et al.
2006/0018622	A1*	1/2006	Caveney et al. 385/135
2006/0034048	A1	2/2006	Xu
2006/0039290	A1	2/2006	Roden et al.
2006/0044774	A1	3/2006	Vasavda et al.
2006/0045458	A1	3/2006	Sasaki et al.
2006/0072606	A1	4/2006	Posthuma
2006/0077968	A1	4/2006	Pitsoulakis et al.
2006/0093303	A1	5/2006	Reagan et al.
2006/0103270	A1	5/2006	Bergesch et al.
2006/0127026	A1	6/2006	Beck
2006/0133736	A1	6/2006	Sullivan
2006/0133759	A1	6/2006	Mullaney et al.
2006/0147172	A1	7/2006	Luther et al.
2006/0153517	A1	7/2006	Reagan et al.
2006/0160377	A1	7/2006	Huang
2006/0165365	A1	7/2006	Feustel et al.
2006/0165366	A1	7/2006	Feustel et al.
2006/0191700	A1	8/2006	Herzog et al.
2006/0193590	A1	8/2006	Puetz et al.
2006/0193591	A1	8/2006	Rapp et al.
2006/0198098	A1	9/2006	Clark et al.
2006/0204179	A1	9/2006	Patel et al.
2006/0215980	A1	9/2006	Bayazit et al.
2006/0225912	A1*	10/2006	Clark et al. 174/135
2006/0228087	A1	10/2006	Bayazit et al.
2006/0269194	A1	11/2006	Luther et al.
2006/0269206	A1	11/2006	Zimmel
2006/0269208	A1	11/2006	Allen et al.
2006/0275008	A1	12/2006	Xin
2006/0275009	A1	12/2006	Ellison et al.
2006/0285812	A1	12/2006	Ferris et al.
2007/0003204	A1	1/2007	Makrides-Saravanos et al.
2007/0025070	A1	2/2007	Jiang et al.
2007/0031099	A1	2/2007	Herzog et al.
2007/0033629	A1	2/2007	McGranahan et al.
2007/0047894	A1	3/2007	Holmberg et al.
2007/0058641	A1	3/2007	Cicchetti et al.
2007/0086723	A1	4/2007	Sasaki et al.
2007/0104447	A1	5/2007	Allen
2007/0110373	A1	5/2007	Dudek et al.
2007/0131628	A1	6/2007	Mimlitch, III et al.
2007/0183732	A1	8/2007	Wittmeier et al.
2007/0189692	A1	8/2007	Zimmel
2007/0196071	A1	8/2007	Laursen et al.
2007/0221793	A1	9/2007	Kusuda et al.
2007/0237484	A1	10/2007	Reagan et al.
2007/0257159	A1	11/2007	Nelson et al.
2007/0266192	A1	11/2007	Campini et al.
2007/0274718	A1	11/2007	Bridges et al.
2008/0011514	A1	1/2008	Zheng et al.
2008/0025683	A1	1/2008	Murano
2008/0031585	A1	2/2008	Solheid et al.
2008/0063350	A1	3/2008	Trebesch et al.
2008/0068788	A1	3/2008	Ozawa et al.
2008/0069511	A1	3/2008	Blackwell, Jr. et al.
2008/0069512	A1	3/2008	Barnes et al.
2008/0078899	A1	4/2008	Chen et al.
2008/0080826	A1	4/2008	Leon et al.
2008/0080827	A1	4/2008	Leon et al.
2008/0080828	A1	4/2008	Leon et al.
2008/0085094	A1	4/2008	Krampotich
2008/0089656	A1	4/2008	Wagner et al.
2008/0095502	A1	4/2008	McColloch
2008/0095541	A1	4/2008	Dallesasse
2008/0100440	A1	5/2008	Downie et al.
2008/0106871	A1	5/2008	James
2008/0112681	A1	5/2008	Bathey et al.
2008/0118207	A1	5/2008	Yamamoto et al.
2008/0121423	A1	5/2008	Vogel et al.
2008/0124039	A1	5/2008	Gniadek et al.
2008/0131068	A1	6/2008	Mertesdorf et al.
2008/0145013	A1	6/2008	Escoto et al.
2008/0152294	A1	6/2008	Hirano et al.
2008/0166094	A1	7/2008	Bookbinder et al.
2008/0166131	A1	7/2008	Hudgins et al.
2008/0175541	A1	7/2008	Lu et al.
2008/0175550	A1	7/2008	Coburn et al.
2008/0175551	A1	7/2008	Smrha et al.
2008/0175552	A1	7/2008	Smrha et al.
2008/0193091	A1	8/2008	Herbst
2008/0205823	A1	8/2008	Luther et al.
2008/0205843	A1	8/2008	Castonguay et al.
2008/0205844	A1	8/2008	Castonguay et al.
2008/0212928	A1	9/2008	Kowalczyk et al.
2008/0219632	A1	9/2008	Smith et al.
2008/0219634	A1	9/2008	Rapp et al.
2008/0236858	A1	10/2008	Quijano
2008/0247723	A1	10/2008	Herzog et al.
2008/0267573	A1	10/2008	Douglas et al.
2008/0285934	A1	11/2008	Standish et al.
2008/0292261	A1	11/2008	Kowalczyk et al.
2008/0296060	A1	12/2008	Hawley et al.
2008/0298763	A1	12/2008	Appenzeller et al.
2008/0310810	A1	12/2008	Gallagher
2009/0010607	A1	1/2009	Elisson et al.

(56)

References Cited

U.S. PATENT DOCUMENTS

2009/0016685	A1	1/2009	Hudgins et al.	2010/0158467	A1	6/2010	Hou et al.
2009/0022470	A1	1/2009	Krampotich	2010/0166377	A1	7/2010	Nair et al.
2009/0038845	A1	2/2009	Fransen et al.	2010/0178022	A1	7/2010	Schroeder et al.
2009/0060439	A1	3/2009	Cox et al.	2010/0202740	A1	8/2010	Barlowe et al.
2009/0060440	A1	3/2009	Wright et al.	2010/0202745	A1	8/2010	Sokolowski et al.
2009/0067800	A1	3/2009	Vazquez et al.	2010/0202748	A1	8/2010	Pierce et al.
2009/0074371	A1	3/2009	Bayazit et al.	2010/0220967	A1	9/2010	Cooke et al.
2009/0080849	A1	3/2009	Hankins et al.	2010/0220968	A1	9/2010	Dagley et al.
2009/0097813	A1	4/2009	Hill	2010/0247051	A1	9/2010	Kowalczyk et al.
2009/0110347	A1	4/2009	Jacobsson	2010/0266245	A1	10/2010	Sabo
2009/0121092	A1	5/2009	Keith	2010/0278499	A1	11/2010	Mures et al.
2009/0136194	A1	5/2009	Barnes	2010/0296790	A1	11/2010	Cooke et al.
2009/0136195	A1	5/2009	Smrha et al.	2010/0296791	A1	11/2010	Makrides-Saravanos et al.
2009/0136196	A1	5/2009	Trebesch et al.	2010/0310225	A1	12/2010	Anderson et al.
2009/0146342	A1	6/2009	Haney et al.	2010/0310226	A1	12/2010	Wakileh et al.
2009/0148117	A1	6/2009	Laurisch	2010/0316334	A1	12/2010	Kewitsch
2009/0166404	A1	7/2009	German et al.	2010/0322554	A1	12/2010	Barnes et al.
2009/0169163	A1	7/2009	Abbott, III et al.	2010/0322579	A1	12/2010	Cooke et al.
2009/0175588	A1	7/2009	Brandt et al.	2010/0322580	A1	12/2010	Beamon et al.
2009/0180749	A1	7/2009	Douglas et al.	2010/0322581	A1	12/2010	Cooke et al.
2009/0184221	A1	7/2009	Sculler	2010/0322582	A1	12/2010	Cooke et al.
2009/0185782	A1	7/2009	Parikh et al.	2010/0322583	A1	12/2010	Cooke et al.
2009/0191891	A1	7/2009	Ma et al.	2010/0329624	A1	12/2010	Zhou et al.
2009/0194647	A1	8/2009	Keith	2011/0008004	A1	1/2011	Liao et al.
2009/0196563	A1	8/2009	Mullsteff et al.	2011/0069931	A1	3/2011	Cote et al.
2009/0202214	A1	8/2009	Holmberg et al.	2011/0073730	A1	3/2011	Kitchen
2009/0207577	A1	8/2009	Fransen et al.	2011/0085774	A1	4/2011	Murphy et al.
2009/0208178	A1	8/2009	Kowalczyk et al.	2011/0085776	A1	4/2011	Biribuze et al.
2009/0208210	A1	8/2009	Trojer et al.	2011/0097053	A1	4/2011	Smith et al.
2009/0212679	A1	8/2009	Frousiakis et al.	2011/0097977	A1	4/2011	Bubnick et al.
2009/0214171	A1	8/2009	Coburn et al.	2011/0129185	A1	6/2011	Lewallen et al.
2009/0220200	A1	9/2009	Wong et al.	2011/0129186	A1	6/2011	Lewallen et al.
2009/0220204	A1	9/2009	Ruiz	2011/0186532	A1	8/2011	Wu
2009/0226142	A1	9/2009	Barnes et al.	2011/0192631	A1	8/2011	Burek et al.
2009/0238531	A1	9/2009	Holmberg et al.	2011/0211799	A1	9/2011	Conner et al.
2009/0245743	A1	10/2009	Cote et al.	2011/0217014	A1	9/2011	Dominique
2009/0252472	A1	10/2009	Solheid et al.	2011/0217016	A1	9/2011	Mullsteff
2009/0257726	A1	10/2009	Redmann et al.	2011/0222821	A1	9/2011	Pitwon et al.
2009/0257727	A1	10/2009	Laurisch et al.	2011/0249950	A1	10/2011	Ramirez et al.
2009/0257754	A1	10/2009	Theodoras, II et al.	2011/0268404	A1	11/2011	Cote et al.
2009/0263096	A1	10/2009	Solheid et al.	2011/0268405	A1	11/2011	Cote et al.
2009/0263122	A1	10/2009	Helkey et al.	2011/0268407	A1	11/2011	Cowen et al.
2009/0267865	A1	10/2009	Miller et al.	2011/0268408	A1	11/2011	Giraud et al.
2009/0269016	A1	10/2009	Korampally et al.	2011/0268413	A1	11/2011	Cote et al.
2009/0269018	A1	10/2009	Frohlich et al.	2011/0280537	A1	11/2011	Cowen et al.
2009/0269019	A1	10/2009	Andrus et al.	2012/0025683	A1	2/2012	Mattlin et al.
2009/0274429	A1	11/2009	Krampotich et al.	2012/0051707	A1	3/2012	Barnes et al.
2009/0274430	A1	11/2009	Krampotich et al.	2012/0057838	A1	3/2012	Hill et al.
2009/0274432	A1	11/2009	Iwaya	2012/0106899	A1	5/2012	Choi
2009/0290842	A1	11/2009	Bran de Leon et al.	2012/0183263	A1	7/2012	Wu
2009/0290843	A1	11/2009	Reagan et al.	2012/0183289	A1	7/2012	Lou et al.
2009/0297111	A1	12/2009	Reagan et al.	2012/0219263	A1	8/2012	Beamon et al.
2009/0304342	A1	12/2009	Adomeit et al.	2012/0288244	A1	11/2012	Wu et al.
2009/0324189	A1	12/2009	Hill et al.	2012/0288248	A1	11/2012	Ramirez et al.
2010/0003000	A1	1/2010	Rapp et al.	2012/0301083	A1	11/2012	Carter et al.
2010/0012671	A1	1/2010	Vrondran et al.	2013/0004136	A1	1/2013	Brower et al.
2010/0027953	A1	2/2010	Russell	2013/0058616	A1	3/2013	Cote et al.
2010/0054681	A1	3/2010	Biribuze et al.	2013/0077927	A1	3/2013	O'Connor
2010/0054682	A1	3/2010	Cooke et al.	2013/0214108	A1	8/2013	Irudayaraj et al.
2010/0054683	A1	3/2010	Cooke et al.	2013/0266282	A1	10/2013	Cote et al.
2010/0054684	A1*	3/2010	Cooke et al. 385/135	2013/0308916	A1	11/2013	Buff et al.
2010/0054685	A1	3/2010	Cooke et al.	2014/0003782	A1	1/2014	Blackwell, Jr. et al.
2010/0054686	A1	3/2010	Cooke et al.	2014/0010510	A1	1/2014	Blackard
2010/0054687	A1	3/2010	Ye et al.	2014/0112628	A1	4/2014	Keenum et al.
2010/0061693	A1	3/2010	Bran de Leon et al.				
2010/0074587	A1	3/2010	Loeffelholz et al.				
2010/0080517	A1	4/2010	Cline et al.				
2010/0086267	A1	4/2010	Cooke et al.				
2010/0086274	A1	4/2010	Keith				
2010/0111483	A1	5/2010	Reinhardt et al.				
2010/0119201	A1	5/2010	Smrha et al.				
2010/0129035	A1	5/2010	Teo				
2010/0142544	A1	6/2010	Chapel et al.				
2010/0142910	A1	6/2010	Hill et al.				
2010/0150518	A1	6/2010	Leon et al.				

FOREIGN PATENT DOCUMENTS

CA	2186314	A1	4/1997
CA	2765835	A1	1/2011
CH	688705	A5	1/1998
CN	102460258	A	5/2012
DE	8711970	U1	10/1987
DE	3726718	A1	2/1989
DE	3726719	A1	2/1989
DE	4030301	A1	3/1992
DE	4231181	C1	8/1993
DE	20115940	U1	1/2002
DE	10338848	A1	3/2005
DE	202005009932	U1	11/2005

US 9,008,485 B2

Page 9

(56)

References Cited

FOREIGN PATENT DOCUMENTS

DE	202007000556	U1	10/2007	JP	2002169035	A	6/2002
DE	102007024476	A1	11/2008	JP	3312893	B2	8/2002
DE	202010009385	U1	9/2010	JP	2002305389	A	10/2002
EP	29512	A1	6/1981	JP	3344701	B2	11/2002
EP	0105597	A2	4/1984	JP	2003029054	A	1/2003
EP	0250900	A2	1/1988	JP	3403573	B2	5/2003
EP	0408266	A2	1/1991	JP	2003169026	A	6/2003
EP	0474091	A1	8/1991	JP	2003215353	A	7/2003
EP	0468671	A1	1/1992	JP	2003344701	A	12/2003
EP	0490698	A1	6/1992	JP	3516765	B2	4/2004
EP	0529830	A1	3/1993	JP	2004144808	A	5/2004
EP	0544004	A1	6/1993	JP	2004514931	A	5/2004
EP	0547778	A1	6/1993	JP	3542939	B2	7/2004
EP	0581527	A1	2/1994	JP	2004246147	A	9/2004
EP	0620462	A1	10/1994	JP	2004361652	A	12/2004
EP	0693699	A1	1/1996	JP	2004361893	A	12/2004
EP	0720322	A2	7/1996	JP	3107704	U	2/2005
EP	0776557	B1	6/1997	JP	2005055748	A	3/2005
EP	0940700	A2	9/1999	JP	2005062569	A	3/2005
EP	0949522	A2	10/1999	JP	2005084241	A	3/2005
EP	1041417	A2	10/2000	JP	2005148327	A	6/2005
EP	1056177	A1	11/2000	JP	2005257937	A	9/2005
EP	1065542	A1	1/2001	JP	3763645	B2	4/2006
EP	1162485	A2	12/2001	JP	3778021	B2	5/2006
EP	1203974	A2	5/2002	JP	2006126513	A	5/2006
EP	1289319	A2	3/2003	JP	2006126516	A	5/2006
EP	1310816	A2	5/2003	JP	3794540	B2	7/2006
EP	1316829	A2	6/2003	JP	2006227041	A1	8/2006
EP	1367308	A1	12/2003	JP	3833638	B2	10/2006
EP	1621907	A1	2/2006	JP	2006292924	A	10/2006
EP	1777563	A1	4/2007	JP	3841344	B2	11/2006
EP	2060942	A2	5/2009	JP	3847533	B2	11/2006
EP	2159613	A2	3/2010	JP	200747336	A	2/2007
FR	1586331	A	2/1970	JP	3896035	B2	3/2007
FR	2123728	A5	9/1972	JP	2007067458	A1	3/2007
FR	2378378	A1	8/1978	JP	3934052	B2	6/2007
GB	2241591	A	9/1991	JP	3964191	B2	8/2007
GB	2277812	A	11/1994	JP	3989853	B2	10/2007
GB	2367379	A	4/2002	JP	4026244	B2	12/2007
GB	2377839	A	1/2003	JP	4029494	B2	1/2008
JP	3060994	A	3/1991	JP	4065223	B2	3/2008
JP	3172806	A	7/1991	JP	4093475	B2	6/2008
JP	3281378	A	12/1991	JP	4105696	B2	6/2008
JP	5045541	A	2/1993	JP	4112437	B2	7/2008
JP	06018749	A	1/1994	JP	4118862	B2	7/2008
JP	7308011	A	11/1995	JP	2008176118	A1	7/2008
JP	7318761	A	12/1995	JP	2008180817	A1	8/2008
JP	8007308	A	1/1996	JP	4184329	B2	11/2008
JP	8248235	A	9/1996	JP	2008271017	A	11/2008
JP	8248237	A	9/1996	JP	2008542822	T	11/2008
JP	3487946	A	10/1996	JP	2009503582	T	1/2009
JP	8254620	A	10/1996	JP	2009229506	A	10/2009
JP	3279474	A	10/1997	JP	2012065019	A	3/2012
JP	9258033	A	10/1997	KR	20110037404	A	4/2011
JP	9258055	A	10/1997	WO	9105281	A1	4/1991
JP	2771870	B2	7/1998	WO	9326070	A1	12/1993
JP	3448448	A	8/1998	WO	9520175	A1	7/1995
JP	10227919	A	8/1998	WO	9636896	A1	11/1996
JP	3478944	A	12/1998	WO	9638752	A1	12/1996
JP	10332945	A	12/1998	WO	9712268	A1	4/1997
JP	10339817	A	12/1998	WO	9722025	A1	6/1997
JP	11023858	A	1/1999	WO	9736197	A1	10/1997
JP	2000098138	A	4/2000	WO	9744605	A1	11/1997
JP	2000098139	A	4/2000	WO	9825416	A1	6/1998
JP	2000241631	A	9/2000	WO	9927404	A1	6/1999
JP	2001004849	A	1/2001	WO	0005611	A2	2/2000
JP	3160322	B2	4/2001	WO	0127660	A2	4/2001
JP	2001133636	A	5/2001	WO	0130007	A2	4/2001
JP	3173962	B2	6/2001	WO	0180596	A1	10/2001
JP	3176906	B2	6/2001	WO	0242818	A1	5/2002
JP	2001154030	A	6/2001	WO	03009527	A2	1/2003
JP	2001159714	A	6/2001	WO	03014943	A1	2/2003
JP	2002022974	A	1/2002	WO	2004052066	A1	6/2004
JP	2002077236	A	3/2002	WO	2005020400	A1	3/2005
JP	2002116337	A	4/2002	WO	2006076062	A	7/2006
				WO	2006108024	A1	10/2006
				WO	2007050515	A1	5/2007
				WO	2007079074	A2	7/2007
				WO	2007089682	A2	8/2007

(56)

References Cited**FOREIGN PATENT DOCUMENTS**

WO	2007149215	A2	12/2007	
WO	2008027201	A2	3/2008	
WO	WO 2008/027201	A2	3/2008	 G02B 6/44
WO	2008063054	A2	5/2008	
WO	2008113054	A2	9/2008	
WO	2008157248	A1	12/2008	
WO	2009026688	A1	3/2009	
WO	2009029485	A1	3/2009	
WO	2009030360	A1	3/2009	
WO	2009120280	A2	10/2009	
WO	2010024847	A2	3/2010	
WO	WO 2010/024847	A2	3/2010	 G02B 6/44
WO	2010080745	A1	7/2010	
WO	2011005461	A1	1/2011	

OTHER PUBLICATIONS

International Search Report for PCT/US2012/023635 mailed Sep. 14, 2012, 3 pages.

International Search Report for PCT/US2012/023626 mailed May 22, 2012, 4 pages.

Notice of Allowance for U.S. Appl. No. 13/951,916 mailed Dec. 16, 2013, 12 pages.

International Preliminary Report on Patentability for PCT/US2012/052958 mailed Mar. 13, 2014, 14 pages.

Non-final Office Action for U.S. Appl. No. 12/947,883 mailed Sep. 6, 2013, 9 pages.

Final Office Action for U.S. Appl. No. 12/947,883 mailed Mar. 31, 2014, 13 pages.

International Search Report for PCT/US2011/030446 mailed Jul. 14, 2011, 2 pages.

International Search Report for PCT/US2011/030448 mailed Jul. 20, 2011, 2 pages.

International Search Report for PCT/US2011/030466 mailed Aug. 5, 2011, 2 pages.

International Search Report for PCT/US2012/052958 mailed Mar. 1, 2013, 7 pages.

International Search Report for PCT/US2013/041266 mailed Aug. 20, 2013, 4 pages.

Non-final Office Action for U.S. Appl. No. 13/621,958 mailed Feb. 13, 2014, 10 pages.

Non-final Office Action for U.S. Appl. No. 13/649,417 mailed Feb. 13, 2014, 10 pages.

Non-final Office Action for U.S. Appl. No. 13/663,949 mailed Feb. 3, 2014, 19 pages.

Non-final Office Action for U.S. Appl. No. 12/953,003 mailed Apr. 14, 2014, 13 pages.

Non-final Office Action for U.S. Appl. No. 12/953,039 mailed Apr. 15, 2014, 8 pages.

Final Office Action for U.S. Appl. No. 12/946,139 mailed Apr. 22, 2014, 18 pages.

Final Office Action for U.S. Appl. No. 13/597,549 mailed Apr. 24, 2014, 10 pages.

Final Office Action for U.S. Appl. No. 13/901,074 mailed May 9, 2014, 7 pages.

Notice of Panel Decision for Pre-Appeal Brief for U.S. Appl. No. 12/417,325 mailed Aug. 8, 2012, 2 pages.

Advisory Action for U.S. Appl. No. 12/417,325 mailed Jun. 29, 2012, 3 pages.

Advisory Action for U.S. Appl. No. 12/417,325 mailed Jun. 12, 2012, 3 pages.

Final Office Action for U.S. Appl. No. 12/417,325 mailed Apr. 16, 2012, 6 pages.

Final Office Action for U.S. Appl. No. 12/417,325 mailed Feb. 7, 2012, 7 pages.

Non-final Office Action for U.S. Appl. No. 12/417,325 mailed Jun. 15, 2011, 6 pages.

Notice of Allowance for U.S. Appl. No. 12/487,929 mailed Sep. 12, 2012, 4 pages.

Notice of Allowance for U.S. Appl. No. 12/487,929 mailed Jun. 13, 2012, 8 pages.

Advisory Action for U.S. Appl. No. 12/487,929 mailed Apr. 17, 2012, 3 pages.

Final Office Action for U.S. Appl. No. 12/487,929 mailed Feb. 14, 2012, 6 pages.

Final Office Action for U.S. Appl. No. 12/487,929 mailed Dec. 5, 2011, 7 pages.

Non-final Office Action for U.S. Appl. No. 12/487,929 mailed May 23, 2011, 7 pages.

Notice of Allowance for U.S. Appl. No. 12/415,253 mailed Mar. 11, 2011, 7 pages.

Non-final Office Action for U.S. Appl. No. 12/415,253 mailed Jul. 12, 2010, 11 pages.

Final Office Action for U.S. Appl. No. 12/415,253 mailed Apr. 16, 2010, 9 pages.

Non-final Office Action for U.S. Appl. No. 12/415,253 mailed Sep. 30, 2009, 8 pages.

Non-final Office Action for U.S. Appl. No. 12/641,617 mailed Oct. 5, 2012, 21 pages.

Final Office Action for U.S. Appl. No. 12/630,938 mailed Jun. 1, 2012, 18 pages.

Non-final Office Action for U.S. Appl. No. 12/630,938 mailed Dec. 19, 2011, 15 pages.

Non-final Office Action for U.S. Appl. No. 12/751,884 mailed Jul. 2, 2012, 9 pages.

Non-final Office Action for U.S. Appl. No. 12/871,052 mailed Aug. 13, 2012, 8 pages.

Annex to Form PCT/ISA/2006, Communication Relating to the Results of the Partial International Search, for PCT/US2009/004549 mailed Feb. 10, 2010, 2 pages.

Annex to Form PCT/ISA/206, Communication Relating to the Results of the Partial International Search, for PCT/US2009/004548 mailed Jan. 19, 2010, 2 pages.

Corning Cable Systems, "Corning Cable Systems Products for BellSouth High Density Shelves," Jun. 2000, 2 pages.

Corning Cable Systems, "Corning Cable Systems Quick Reference Guide for Verizon FTTN FDH Products," Jun. 2005, 4 pages.

Conner, M. "Passive Optical Design for RFOG and Beyond," Broadband Properties, Apr. 2009, pp. 78-81.

Corning Evolant, "Eclipse Hardware Family," Nov. 2009, 1 page.

Corning Evolant, "Enhanced Management Frame," Dec. 2009, 1 page.

Corning Evolant, "Enhanced Management Frame (EMF)," Specification Sheet, Nov. 2009, 24 pages.

Corning Cable Systems, "Evolant Solutions for Evolving Networks: Fiber Optic Hardware," Oct. 2002, 2 pages.

Corning Cable Systems, "Fiber Optic Hardware with Factory-Installed Pigtails: Features and Benefits," Nov. 2010, 12 pages.

Corning Cable Systems, "FiberManager System 1- and 3-Position Compact Shelves," Jan. 2003, 4 pages.

Corning Cable Systems, "FiberManager System Frame and Components," Jan. 2003, 12 pages.

Corning Cable Systems, "High Density Frame," Jul. 2001, 2 pages.

Corning Cable Systems, "High Density Frame (HDF) Connector-Splice Shelves and Housings," May 2003, 4 pages.

International Search Report for PCT/US10/35529 mailed Jul. 23, 2010, 2 pages.

International Search Report for PCT/US10/35563 mailed Jul. 23, 2012, 1 page.

International Search Report for PCT/US2008/002514 mailed Aug. 8, 2008, 2 pages.

International Search Report for PCT/US2008/010317 mailed Mar. 4, 2008, 2 pages.

International Search Report for PCT/US2009/001692 mailed Nov. 24, 2009, 5 pages.

International Search Report for PCT/US2010/024888 mailed Jun. 23, 2010, 5 pages.

International Search Report for PCT/US2010/027402 mailed Jun. 16, 2010, 2 pages.

Corning Cable Systems, "MTX Frames and Accessories," Feb. 2006, 4 pages.

Panduit, "Lock-in LC Duplex Clip," Accessed Mar. 22, 2012, 1 page.

(56)

References Cited**OTHER PUBLICATIONS**

- International Search Report for PCT/US06/49351 mailed Apr. 25, 2008, 1 page.
- International Search Report for PCT/US09/57069 mailed Mar. 24, 2010, 2 pages.
- International Search Report for PCT/US2009/057244 mailed Nov. 9, 2009 3 pages.
- International Search Report for PCTUS2009004548 mailed Mar. 19, 2010, 5 pages.
- International Search Report for PCTUS2009004549 mailed Apr. 20, 2010, 6 pages.
- Siecor, "Single Shelf HDF with Slack Storage and Heat Shield (HH1-CSH-1238-1V-BS)," Jan. 1998, 12 pages.
- Corning Cable Systems, "Mass Termination Xchange (MTX) Frame System Equipment Office Planning and Application Guide," SRP003-664, Issue 1, Mar. 2005, 57 pages.
- Corning Cable Systems, "Mass Termination Xchange (MTX) Equipment Patch Cord Interbay Vertical Channel," SRP003-684, Issue 1, Mar. 2005, 8 pages.
- Corning Cable Systems, "High Density Frame (HDF) Installation," SRP003-355, Issue 4, Sep. 2002, 18 pages.
- Written Opinion for PCT/US2010/023901 mailed Aug. 25, 2011, 8 pages.
- Advisory Action for U.S. Appl. No. 12/221,117 mailed Aug. 24, 2011, 3 pages.
- Examiner's Answer to Appeal Brief for U.S. Appl. No. 12/221,117 mailed Mar. 29, 2012, 16 pages.
- Final Office Action for U.S. Appl. No. 12/221,117 mailed Feb. 19, 2010, 7 pages.
- Final Office Action for U.S. Appl. No. 12/221,117 mailed Jun. 10, 2011, 8 pages.
- Non-final Office Action for U.S. Appl. No. 12/221,117 mailed Jul. 14, 2010, 7 pages.
- Non-final Office Action for U.S. Appl. No. 12/221,117 mailed Jun. 9, 2009, 5 pages.
- Non-final Office Action for U.S. Appl. No. 12/221,117 mailed Dec. 21, 2010, 7 pages.
- Advisory Action for U.S. Appl. No. 12/394,483 mailed Feb. 16, 2012, 3 pages.
- Final Office Action for U.S. Appl. No. 12/394,483 mailed Dec. 6, 2011, 14 pages.
- Non-final Office Action for U.S. Appl. No. 12/394,483 mailed Jun. 17, 2011, 11 pages.
- Advisory Action for U.S. Appl. No. 12/950,234 mailed Dec. 21, 2011, 3 pages.
- Non-final Office Action for U.S. Appl. No. 12/950,234 mailed Jun. 17, 2011, 7 pages.
- Non-final Office Action for U.S. Appl. No. 12/950,234 mailed Mar. 12, 2012, 10 pages.
- Final Office Action for U.S. Appl. No. 12/950,234 mailed Oct. 14, 2011, 10 pages.
- Advisory Action mailed May 12, 2011, for U.S. Appl. No. 12/323,423, 3 pages.
- Final Rejection mailed Mar. 3, 2011, for U.S. Appl. No. 12/323,423, 17 pages.
- Non-Final Rejection mailed Aug. 5, 2011, for U.S. Appl. No. 12/323,423, 13 pages.
- Unknown, Author, "QuickNet SFQ Series MTP Fiber Optic Cas-ettes," Panduit Specification Sheet, Jan. 2009, 2 pages.
- Unknown Author, "Cellular Specialties introduces the first simulated in-building location-based tracking solution," smart-grid.tmenet.com/news, Sep. 14, 2009, 2 pages.
- Unknown Author, "CDMA Co-Pilot Transmitter," Cellular Specialties, Inc., Aug. 2009, 2 pages.
- International Search Report for PCT/US2010/038986 mailed Aug. 18, 2010, 1 page.
- Notice of Allowance for U.S. Appl. No. 12/871,052 mailed Sep. 18, 2013, 9 pages.
- Non-final Office Action for U.S. Appl. No. 12/953,039 mailed Sep. 12, 2013, 8 pages.
- Non-final Office Action for U.S. Appl. No. 12/946,139 mailed Oct. 2, 2013, 18 pages.
- Final Office Action for U.S. Appl. No. 12/394,114 mailed Oct. 4, 2013, 10 pages.
- Non-final Office Action for U.S. Appl. No. 12/818,986 mailed Oct. 4, 2013, 19 pages.
- Non-final Office Action for U.S. Appl. No. 13/901,074 mailed Oct. 9, 2013, 6 pages.
- Advisory Action for U.S. Appl. No. 12/953,134 mailed Nov. 4, 2013, 3 pages.
- Final Office Action for U.S. Appl. No. 12/952,960 mailed Oct. 29, 2013, 8 pages.
- Notice of Allowance for U.S. Appl. No. 13/292,130 mailed Oct. 18, 2013, 9 pages.
- International Search Report and Written Opinion for PCT/US2011/035683 mailed Sep. 8, 2011, 15 pages.
- International Search Report and Written Opinion for PCT/US2010/039218 mailed Oct. 27, 2010, 13 pages.
- First Office Action for Chinese patent application 201080032453.2 issued Mar. 26, 2013, 6 pages.
- Chinese Search Report for Chinese patent application 201080032453.2 mailed May 15, 2013, 2 pages.
- First Office Action for Chinese patent application 201080031621.6 mailed Sep. 26, 2013, 9 pages.
- Chinese Search Report for Chinese patent application 201080031621.6 mailed Sep. 13, 2013, 2 pages.
- Ramdas, "Modern File Systems and Storage," Proceedings of the 2nd International SANE Conference, May 22-25, 2000, MECC, Maastricht, The Netherlands, Copyright Rodney R. Ramdas, 10 pages.
- International Search Report and Written Opinion for PCT/US2011/035684 mailed Jul. 1, 2011, 11 pages.
- International Search Report and Written Opinion for PCT/US11/61754 mailed Mar. 26, 2012, 9 pages.
- Author Unknown, "144 Fiber Patch Panel 1U," Technical Data, ADTEK Group Limited, 2009, 2 pages.
- Advisory Action for U.S. Appl. No. 12/394,114 mailed Jan. 2, 2014, 3 pages.
- Notice of Allowance for U.S. Appl. No. 12/871,052 mailed Dec. 24, 2013, 9 pages.
- Final Office Action for U.S. Appl. No. 12/953,039 mailed Dec. 27, 2013, 10 pages.
- Advisory Action for U.S. Appl. No. 12/952,960 mailed Jan. 8, 2014, 3 pages.
- Advisory Action for U.S. Appl. No. 12/952,912 mailed Nov. 26, 2013, 3 pages.
- Examiner's Answer to the Appeal Brief for U.S. Appl. No. 12/953,118 mailed Dec. 3, 2013, 6 pages.
- Non-final Office Action for U.S. Appl. No. 13/597,549 mailed Jan. 14, 2014, 9 pages.
- Final Office Action for U.S. Appl. No. 12/732,487 mailed Dec. 6, 2013, 24 pages.
- Final Office Action for U.S. Appl. No. 12/956,446 mailed Dec. 23, 2013, 12 pages.
- Non-final Office Action for U.S. Appl. No. 12/953,536 mailed Dec. 17, 2013, 21 pages.
- Non-final Office Action for U.S. Appl. No. 12/819,065 mailed Dec. 3, 2013, 8 pages.
- International Search Report and Written Opinion for PCT/US2011/062353 mailed Apr. 10, 2012, 15 pages.
- International Search Report for PCT/US2013/041268 mailed Aug. 20, 2013, 5 pages.
- Notice of Allowance for U.S. Appl. No. 13/292,130 mailed Feb. 14, 2014, 7 pages.
- Final Office Action for U.S. Appl. No. 12/707,889 mailed Feb. 11, 2014, 17 pages.
- Non-final Office Action for U.S. Appl. No. 12/940,699 mailed Feb. 3, 2014, 10 pages.
- Notice of Allowance for U.S. Appl. No. 12/952,960 mailed Feb. 13, 2014, 7 pages.
- Notice of Allowance and Applicant-Initiated Interview Summary for U.S. Appl. No. 12/771,473 mailed Feb. 27, 2014, 8 pages.

(56)

References Cited**OTHER PUBLICATIONS**

Non-final Office Action for U.S. Appl. No. 13/081,856 mailed Nov. 26, 2013, 11 pages.
 Non-final Office Action for U.S. Appl. No. 13/663,975 mailed Jan. 31, 2014, 18 pages.
 Non-final Office Action for U.S. Appl. No. 12/394,114 mailed Mar. 21, 2014, 9 pages.
 Final Office Action for U.S. Appl. No. 12/940,585 mailed Mar. 18, 2014, 15 pages.
 Non-final Office Action for U.S. Appl. No. 12/953,101 mailed Apr. 3, 2014, 9 pages.
 Advisory Action for U.S. Appl. No. 12/953,039 mailed Mar. 6, 2014, 3 pages.
 Advisory Action for U.S. Appl. No. 12/956,446 mailed Mar. 20, 2014, 3 pages.
 Final Office Action for U.S. Appl. No. 13/603,894 mailed Mar. 20, 2014, 15 pages.
 Notice of Allowance for U.S. Appl. No. 12/417,325 mailed Aug. 22, 2012, 7 pages.
 International Search Report for PCT/US2010/023901 mailed Jun. 11, 2010, 3 pages.
 Notice of Allowance for U.S. Appl. No. 12/576,769 mailed May 31, 2012, 9 pages.
 Non-final Office Action for U.S. Appl. No. 12/576,806 mailed Dec. 13, 2011, 6 pages.
 Notice of Allowance for U.S. Appl. No. 12/576,806 mailed Apr. 18, 2012, 5 pages.
 Non-final Office Action for U.S. Appl. No. 13/688,675 mailed Jan. 31, 2014, 13 pages.
 Non-final Office Action for U.S. Appl. No. 12/946,217 mailed Jul. 26, 2012, 25 pages.
 Final Office Action for U.S. Appl. No. 12/946,217 mailed Mar. 18, 2013, 48 pages.
 Non-final Office Action for U.S. Appl. No. 12/946,217 mailed Oct. 3, 2013, 47 pages.
 Final Office Action for U.S. Appl. No. 12/946,217 mailed Apr. 25, 2014, 40 pages.
 Non-final Office Action for U.S. Appl. No. 13/833,876 mailed Apr. 24, 2014, 7 pages.
 Notice of Allowance for U.S. Appl. No. 12/953,536 mailed May 20, 2014, 9 pages.
 Advisory Action for U.S. Appl. No. 12/707,889 mailed Jun. 11, 2014, 4 pages.
 Advisory Action for U.S. Appl. No. 12/940,585 mailed Jun. 17, 2014, 3 pages.
 Advisory Action for U.S. Appl. No. 12/947,883 mailed Jun. 19, 2014, 3 pages.
 Non-final Office Action for U.S. Appl. No. 12/732,487 mailed Jun. 20, 2014, 24 pages.
 Non-final Office Action for U.S. Appl. No. 13/621,958 mailed Jun. 20, 2014, 13 pages.
 Final Office Action for U.S. Appl. No. 13/649,417 mailed Jun. 25, 2014, 9 pages.
 Non-final Office Action for U.S. Appl. No. 12/952,960 mailed Jun. 26, 2014, 13 pages.
 Non-final Office Action for U.S. Appl. No. 13/746,938 mailed Jul. 11, 2014, 9 pages.
 Non-final Office Action for U.S. Appl. No. 12/751,895 mailed May 20, 2014, 9 pages.
 Notice of Allowance for U.S. Appl. No. 13/533,093 mailed Jul. 8, 2014, 9 pages.
 Notice of Allowance for U.S. Appl. No. 13/597,549 mailed Jul. 8, 2014, 8 pages.
 Notice of Allowance for U.S. Appl. No. 13/455,646 mailed Jun. 2, 2014, 9 pages.
 Non-final Office Action for U.S. Appl. No. 12/819,065 mailed Jul. 18, 2014, 10 pages.
 Final Office Action for U.S. Appl. No. 12/818,986 mailed Jul. 18, 2014, 27 pages.

Final Office Action for U.S. Appl. No. 13/081,856 mailed Jul. 2, 2014, 8 pages.
 Notice of Allowance for U.S. Appl. No. 12/221,117 mailed Jul. 16, 2014, 7 pages.
 Decision on Appeal for U.S. Appl. No. 12/221,117 mailed Jul. 1, 2014, 7 pages.
 Final Office Action for U.S. Appl. No. 12/394,114 mailed Oct. 25, 2012, 8 pages.
 Non-final Office Action for U.S. Appl. No. 12/915,682 mailed Oct. 24, 2012, 8 pages.
 Non-final Office Action for U.S. Appl. No. 12/818,986 mailed Feb. 3, 2012, 12 pages.
 Final Office Action for U.S. Appl. No. 12/818,986 mailed Oct. 18, 2012, 13 pages.
 Non-final Office Action for U.S. Appl. No. 12/952,960 mailed Oct. 4, 2012, 11 pages.
 Non-final Office Action for U.S. Appl. No. 12/953,134 mailed Sep. 25, 2012, 8 pages.
 Non-final Office Action for U.S. Appl. No. 12/953,039 mailed Jan. 11, 2013, 6 pages.
 Non-final Office Action for U.S. Appl. No. 12/952,912 mailed Dec. 28, 2012, 9 pages.
 Non-final Office Action for U.S. Appl. No. 12/953,118 mailed Jan. 7, 2013, 9 pages.
 Non-final Office Action for U.S. Appl. No. 12/953,536 mailed Jan. 2, 2013, 20 pages.
 Non-final Office Action for U.S. Appl. No. 12/707,889 mailed Jan. 2, 2013, 7 pages.
 European Search Report for patent application 10790017.7 mailed Nov. 8, 2012, 7 pages.
 Examination Report for European patent application 09789090.9-2216 mailed Aug. 29, 2011, 4 pages.
 Examination Report for European patent application 09789090.9-2216 mailed Mar. 30, 2012, 6 pages.
 Written Opinion of the International Searching Authority for International patent application PCT/US2009004548, mailed Apr. 5, 2011, 6 pages.
 European Search Report for European patent application 09789090.9-2217 mailed Jan. 24, 2013, 5 pages.
 Non-final Office Action for U.S. Appl. No. 12/946,139 mailed Jul. 26, 2012, 12 pages.
 Final Office Action for U.S. Appl. No. 12/946,139 mailed Feb. 15, 2013, 17 pages.
 Non-final Office Action for U.S. Appl. No. 12/751,884 mailed Feb. 15, 2013, 5 pages.
 Non-final Office Action for U.S. Appl. No. 12/394,114 mailed Feb. 27, 2013, 8 pages.
 Non-final Office Action for U.S. Appl. No. 12/819,065 mailed Mar. 4, 2013, 7 pages.
 Final Office Action for U.S. Appl. No. 12/952,960 mailed Mar. 7, 2013, 13 pages.
 Notice of Allowance for U.S. Appl. No. 12/732,487 mailed Mar. 19, 2013, 11 pages.
 Non-final Office Action for U.S. Appl. No. 12/953,134 mailed Mar. 21, 2013, 9 pages.
 Final Office Action for U.S. Appl. No. 12/641,617 mailed May 10, 2013, 21 pages.
 Notice of Allowance for U.S. Appl. No. 13/090,621 mailed Apr. 22, 2013, 8 pages.
 Final Office Action for U.S. Appl. No. 12/953,039 mailed May 1, 2013, 8 pages.
 Final Office Action for U.S. Appl. No. 12/953,118 mailed May 3, 2013, 11 pages.
 Final Office Action for U.S. Appl. No. 12/915,682 mailed Apr. 18, 2013, 9 pages.
 Advisory Action for U.S. Appl. No. 12/952,960 mailed May 15, 2013, 2 pages.
 Non-final Office Action for U.S. Appl. No. 12/952,960 mailed Jun. 20, 2013, 13 pages.
 Non-final Office Action for U.S. Appl. No. 12/953,536 mailed Jun. 6, 2013, 21 pages.
 Non-final Office Action for U.S. Appl. No. 11/820,300 mailed Apr. 25, 2012, 10 pages.

(56)

References Cited**OTHER PUBLICATIONS**

Final Office Action for U.S. Appl. No. 12/871,052 mailed Jul. 1, 2013, 12 pages.
 Non-final Office Action for U.S. Appl. No. 12/940,699 mailed Jun. 26, 2013, 9 pages.
 Notice of Allowance for U.S. Appl. No. 13/090,621 mailed Jun. 25, 2013, 8 pages.
 Non-final Office Action for U.S. Appl. No. 12/956,475 mailed Oct. 4, 2012, 7 pages.
 Non-final Office Action for U.S. Appl. No. 13/302,067 mailed Jun. 7, 2013, 13 pages.
 Final Office Action for U.S. Appl. No. 12/771,473 mailed Jul. 19, 2013, 7 pages.
 Notice of Allowance for U.S. Appl. No. 12/751,884 mailed Jul. 17, 2013, 8 pages.
 Non-final Office Action for U.S. Appl. No. 12/940,585 mailed Aug. 16, 2013, 14 pages.
 Final Office Action for U.S. Appl. No. 12/953,134 mailed Aug. 23, 2013, 11 pages.
 Ex parte Quayle Action for U.S. Appl. No. 12/953,164 mailed Aug. 16, 2013, 5 pages.
 Non-final Office Action for U.S. Appl. No. 12/732,487 mailed Jul. 17, 2013, 22 pages.
 Advisory Action for U.S. Appl. No. 12/953,039 mailed Jul. 12, 2013, 3 pages.
 Advisory Action for U.S. Appl. No. 12/953,118 mailed Jul. 12, 2013, 3 pages.
 Advisory Action for U.S. Appl. No. 12/641,617 mailed Jul. 29, 2013, 3 pages.
 Final Office Action for U.S. Appl. No. 12/952,912 mailed Aug. 30, 2013, 15 pages.
 Advisory Action for U.S. Appl. No. 12/771,473 mailed Oct. 2, 2013, 3 pages.
 Notice of Allowance for U.S. Appl. No. 12/641,617 mailed Sep. 4, 2013, 9 pages.
 Non-Final Rejection mailed Sep. 7, 2010, for U.S. Appl. No. 12/323,423, 18 pages.
 Notice of Allowance for U.S. Appl. No. 12/323,423 mailed Jan. 24, 2012, 8 pages.
 Examiner's Answer mailed Mar. 4, 2011, for U.S. Appl. No. 12/323,415, 11 pages.
 Final Rejection mailed Jun. 25, 2010, for U.S. Appl. No. 12/323,415, 10 pages.
 Non-Final Rejection mailed Aug. 5, 2011, for U.S. Appl. No. 12/323,415, 41 pages.
 Non-final Office Action for U.S. Appl. No. 12/323,415 mailed Apr. 23, 2012, 11 pages.
 Non-Final Rejection mailed Dec. 10, 2009, for U.S. Appl. No. 12/323,415, 7 pages.
 Examiner's Answer to Appeal Brief for U.S. Appl. No. 11/320,062 mailed Dec. 8, 2011, 8 pages.
 Final Office Action for U.S. Appl. No. 11/320,062 mailed Mar. 8, 2011, 8 pages.
 Non-final Office Action for U.S. Appl. No. 11/320,062 mailed Jan. 15, 2010, 11 pages.
 Non-final Office Action for U.S. Appl. No. 12/320,062 mailed Sep. 30, 2010, 7 pages.
 Final Office Action for U.S. Appl. No. 11/439,086 mailed Feb. 4, 2010, 14 pages.
 Non-final Office Action for U.S. Appl. No. 11/439,086 mailed May 3, 2010, 11 pages.
 Non-final Office Action for U.S. Appl. No. 11/439,086 mailed Sep. 21, 2009, 10 pages.
 Final Office Action for U.S. Appl. No. 12/079,481 mailed Mar. 18, 2010, 10 pages.
 Non-final Office Action for U.S. Appl. No. 12/079,481 mailed Dec. 26, 2008, 9 pages.
 Non-final Office Action for U.S. Appl. No. 12/079,481 mailed Sep. 16, 2009, 10 pages.

Notice of Allowance for U.S. Appl. No. 12/079,481 mailed Jun. 3, 2010, 6 pages.
 Notice of Allowance for U.S. Appl. No. 12/079,481 mailed Oct. 4, 2010, 4 pages.
 Final Office Action for U.S. Appl. No. 12/394,114 mailed Dec. 22, 2011, 8 pages.
 Non-final Office Action for U.S. Appl. No. 12/394,114 mailed Mar. 16, 2012, 8 pages.
 Non-final Office Action for U.S. Appl. No. 12/394,114 mailed Sep. 1, 2011, 7 pages.
 Non-final Office Action for U.S. Appl. No. 12/323,373 mailed May 3, 2012, 7 pages.
 Non-final Office Action for U.S. Appl. No. 11/809,474 mailed Apr. 8, 2008, 13 pages.
 Non-final Office Action for U.S. Appl. No. 11/809,474 mailed Nov. 13, 2008, 10 pages.
 Notice of Allowance for U.S. Appl. No. 11/809,474 mailed Jul. 6, 2009, 6 pages.
 Final Office Action for U.S. Appl. No. 11/320,031 mailed Mar. 8, 2011, 8 pages.
 Non-final Office Action for U.S. Appl. No. 11/320,031 mailed Jan. 5, 2010, 16 pages.
 Non-final Office Action for U.S. Appl. No. 11/320,031 mailed Sep. 30, 2010, 7 pages.
 Notice of Allowance for U.S. Appl. No. 11/320,031 mailed Nov. 15, 2011, 7 pages.
 Non-final Office Action for U.S. Appl. No. 12/157,622 mailed Mar. 31, 2009, 9 pages.
 Non-final Office Action for U.S. Appl. No. 12/157,622 mailed Oct. 15, 2009, 9 pages.
 Notice of Allowance for U.S. Appl. No. 12/157,622 mailed Apr. 22, 2010, 4 pages.
 Non-final Office Action for U.S. Appl. No. 12/323,395 mailed Dec. 8, 2011, 7 pages.
 Non-final Office Action for U.S. Appl. No. 12/415,454 mailed Mar. 2, 2012, 5 pages.
 Non-final Office Action for U.S. Appl. No. 12/415,454 mailed Sep. 6, 2011, 7 pages.
 Notice of Allowance for U.S. Appl. No. 12/415,454 mailed Jan. 13, 2012, 5 pages.
 Non-final Office Action for U.S. Appl. No. 12/576,769 mailed Feb. 2, 2012, 23 pages.
 Notice of Allowance for U.S. Appl. No. 12/415,454 mailed Jun. 19, 2012, 5 pages.
 Non-final Office Action for U.S. Appl. No. 13/603,894 mailed Oct. 3, 2013, 9 pages.
 International Search Report for PCT/US2009/066779 mailed Aug. 27, 2010, 3 pages.
 "MPO Fiber Optic Rack Panels now available from L-com Connectivity Products," article dated Jun. 4, 2007, 16 pages, <http://www.l-com.com/content/Article.aspx?Type=P&ID=438>.
 "19" Rack Panel with 16 MPO Fiber Optic Couplers—1U high," product page, accessed Oct. 23, 2012, 2 pages, <http://www.l-com.com/item.aspx?id=9767#.UlbG8XXay5>.
 "Drawing for L-com 1U Panel with 16 MTP couplers," May 15, 2007, 1 page, http://www.l-com.com/multimedia/eng_drawings/PR17516MTP.pdf.
 "RapidNet Fibre MTP VHD Cassette," Brochure, Date Unknown, 1 page, http://www.hellermannntyton.se/documents/5000/576_fiber_1U.pdf.
 "MPO for Gigabit Ethernet/FAS-NET MTP Solution," Brochure, Date Unknown, 11 pages, <http://www.infinique.com/upload/13182286190.pdf>.
 "Hubbell OptiChannel High Density 144 Port 1U Fiber Enclosure," Brochure, Date Unknown, 2 pages, <http://www.hubbell-premise.com/literature/PLDF010.pdf>.
 Non-final Office Action for U.S. Appl. No. 12/771,473 mailed Oct. 4, 2012, 6 pages.
 Non-final Office Action for U.S. Appl. No. 12/819,081 mailed Aug. 21, 2012, 12 pages.
 Final Office Action for U.S. Appl. No. 12/953,039 mailed Jul. 25, 2014, 10 pages.

(56)

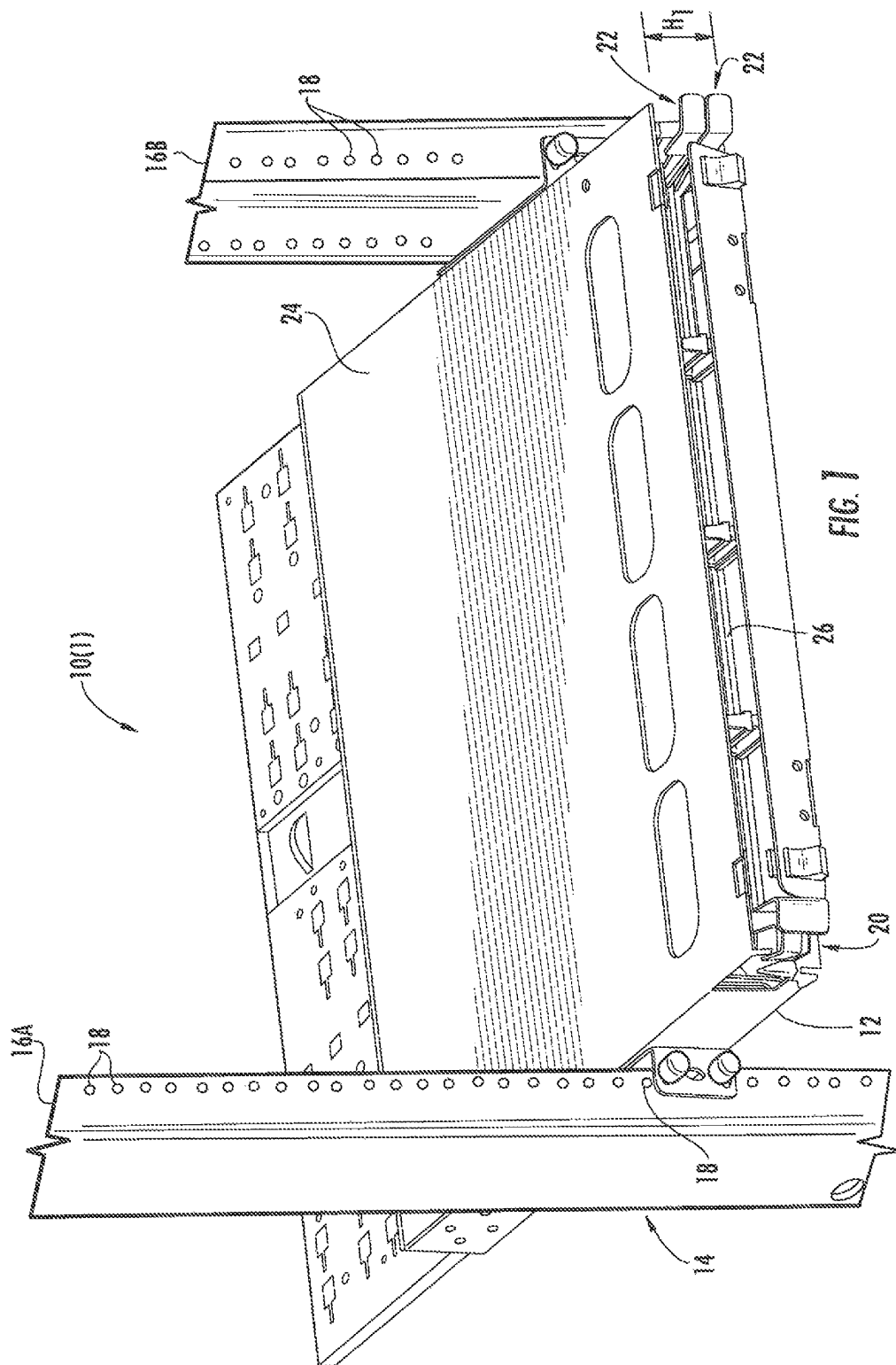
References Cited

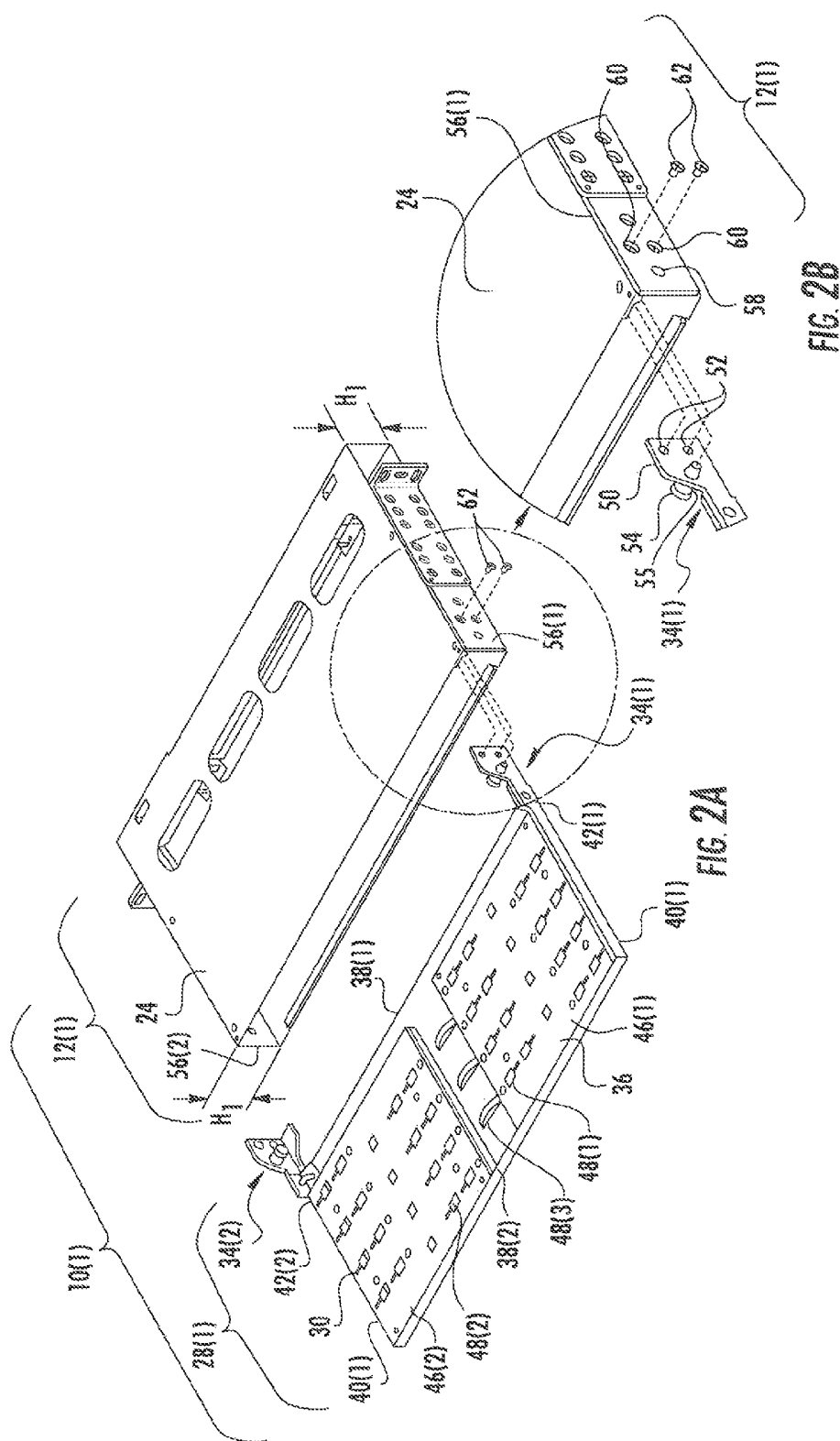
OTHER PUBLICATIONS

Advisory Action for U.S. Appl. No. 12/953,039 mailed Oct. 3, 2014, 3 pages.
 Notice of Allowance for U.S. Appl. No. 12/953,536 mailed Aug. 28, 2014, 9 pages.
 Final Office Action for U.S. Appl. No. 13/901,074 mailed Sep. 5, 2014, 7 pages.
 Final Office Action for U.S. Appl. No. 13/663,975 mailed Aug. 14, 2014, 42 pages.
 Corrected Notice of Allowance for U.S. Appl. No. 13/533,093 mailed Sep. 2, 2014, 7 pages.
 Notice of Allowance for U.S. Appl. No. 13/649,417 mailed Sep. 8, 2014, 7 pages.
 Examiner's Answer to the Appeal for U.S. Appl. No. 12/952,912 mailed Sep. 11, 2014, 15 pages.
 Advisory Action and Examiner-Initiated Interview Summary for U.S. Appl. No. 13/081,856 mailed Sep. 16, 2014, 4 pages.
 Non-Final Office Action for U.S. Appl. No. 13/663,949 mailed Sep. 25, 2014, 21 pages.
 Non-Final Office Action for U.S. Appl. No. 13/688,675 mailed Sep. 30, 2014, 9 pages.
 Notice of Allowance for U.S. Appl. No. 13/597,549 mailed Oct. 3, 2014, 8 pages.
 Decision on Appeal for U.S. Appl. No. 11/320,062 mailed Aug. 14, 2014, 8 pages.
 Final Office Action for U.S. Appl. No. 12/953,101 mailed Oct. 20, 2014, 14 pages.

Notice of Allowance for U.S. Appl. No. 13/533,093 mailed Oct. 17, 2014, 9 pages.
 Notice of Allowance for U.S. Appl. No. 12/732,487 mailed Oct. 7, 2014, 8 pages.
 Non-Final Office Action for U.S. Appl. No. 13/567,288 mailed Oct. 8, 2014, 7 pages.
 Advisory Action for U.S. Appl. No. 12/818,986 mailed Oct. 15, 2014, 5 pages.
 Examiner's Answer to the Appeal Brief for U.S. Appl. No. 12/953,134 mailed Aug. 1, 2014, 7 pages.
 Final Office Action for U.S. Appl. No. 12/394,114 mailed Oct. 31, 2014, 10 pages.
 Non-final Office Action for U.S. Appl. No. 12/940,699 mailed Oct. 28, 2014, 9 pages.
 Non-final Office Action for U.S. Appl. No. 12/953,039 mailed Nov. 12, 2014, 8 pages.
 Notice of Allowance for U.S. Appl. No. 12/952,960 mailed Nov. 10, 2014, 7 pages.
 Notice of Allowance for U.S. Appl. No. 13/081,856 mailed Oct. 29, 2014, 10 pages.
 Notice of Allowance for U.S. Appl. No. 13/833,876 mailed Nov. 7, 2014, 7 pages.
 Advisory Action for U.S. Appl. No. 13/901,074 mailed Nov. 24, 2014, 3 pages.
 Notice of Allowance for U.S. Appl. No. 12/751,895 mailed Nov. 19, 2014, 8 pages.
 Non-final Office Action for U.S. Appl. No. 12/956,446 mailed Dec. 5, 2014, 12 pages.

* cited by examiner





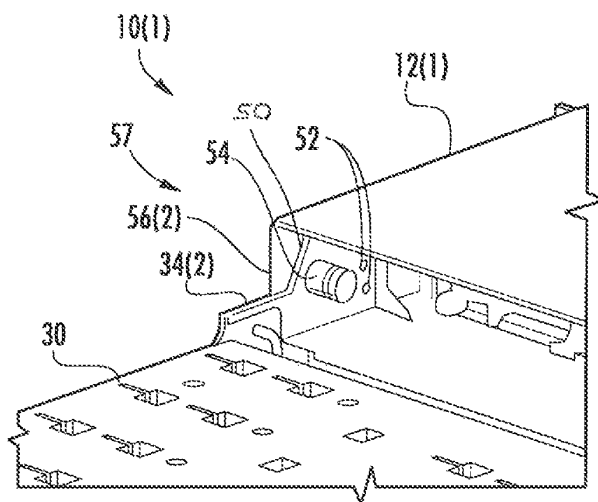
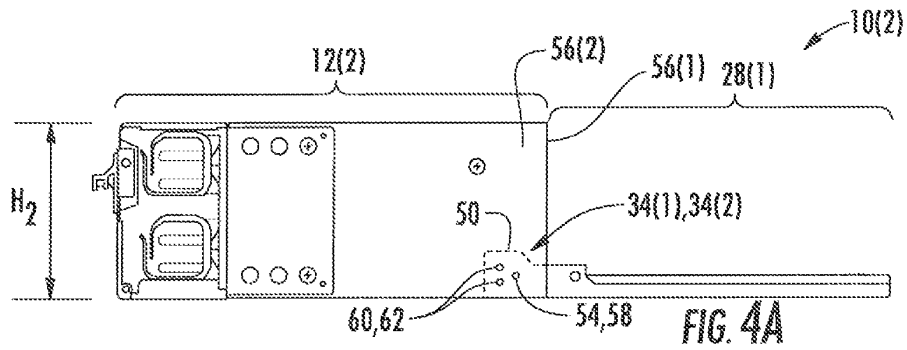
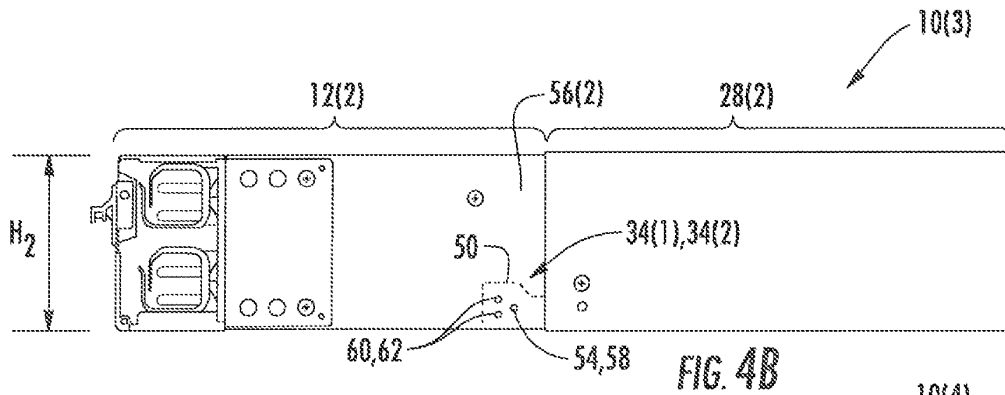
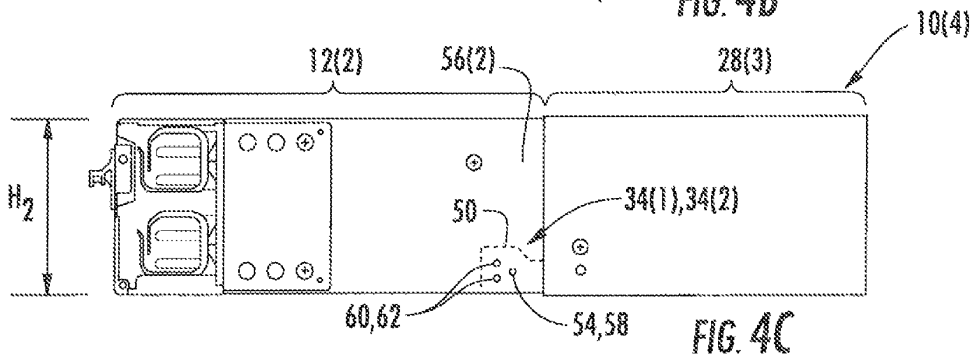
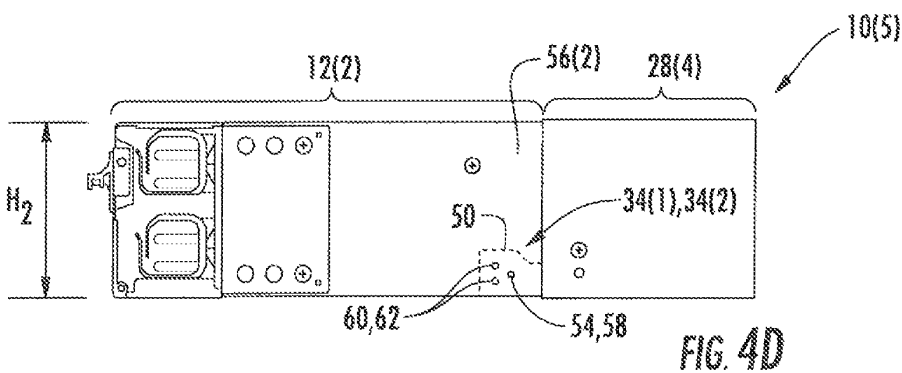
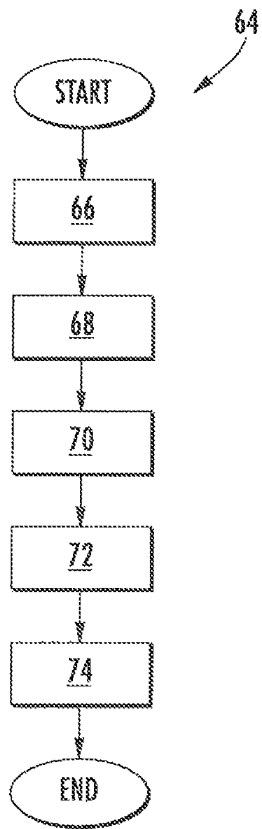
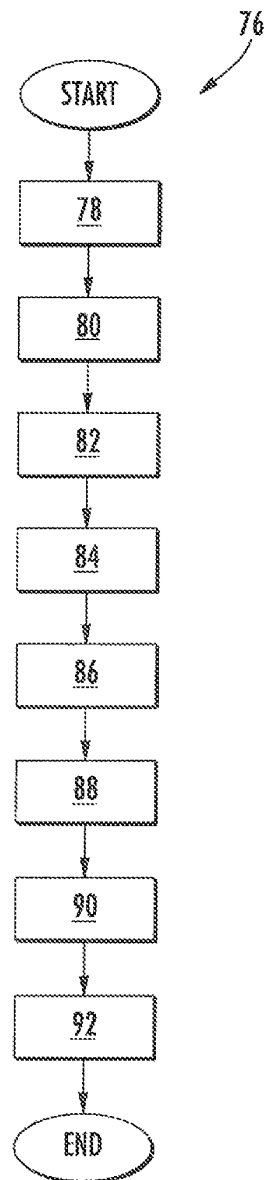


FIG. 3



*FIG. 5**FIG. 6*

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ATTACHMENT MECHANISMS EMPLOYED TO ATTACH A REAR HOUSING SECTION TO A FIBER OPTIC HOUSING, AND RELATED ASSEMBLIES AND METHODS

PRIORITY APPLICATION

This application claims the benefit of priority under 35 U.S.C. §119 of U.S. Provisional Application Ser. No. 61/483, 918 filed on May 9, 2011, the content of which is relied upon and incorporated herein by reference in its entirety.

BACKGROUND OF THE DISCLOSURE

1. Field of the Disclosure

The present disclosure relates to fiber optic equipment for use in data centers and/or central offices, and more particularly to a rear housing section attached to a fiber optic chassis or housing in data centers and/or central offices.

2. Technical Background

Typical fiber optic telecommunication systems and networks include one or more telecommunications data centers and/or central offices. Large numbers of fiber optic and electrical cable connections that join various types of network equipment may be located in such facilities. The typical system also includes a number of outlying stations that extend the system into a network.

This network equipment is often installed within cabinets in standard-sized equipment racks. Each piece of equipment typically provides one or more adapters where fiber optic or electrical patch cables and or trunk fiber optic cables can be physically connected to the equipment. These patch cables are generally routed to other network equipment located in the same cabinet, while trunk cables are generally routed between cabinets. A common problem in telecommunications systems, and in particular with fiber optic telecommunications equipment, is space management. Current practice in telecommunications is to utilize standard electronics racks or frames that support standard-sized stationary rack-mounted housings with widths of 19 or 23 inches horizontal spacing. Vertical spacing has been divided into rack units "U," where 1U=1.75 inches as specified in EIA (Electronic Industries Alliance) 310-D, IEC (International Electrotechnical Commission) 60297 and DIN ("German Institute for Standardization") 41494 SC48D.

Telecommunications systems are integral to every aspect of an operation of a business. As such, the business may require new and additional programs and applications, particularly as the business grows. This growth can result in more demand on and expansion of the facility, particularly a data center. Therefore, space management in a data center becomes even more critical.

SUMMARY OF THE DETAILED DESCRIPTION

Embodiments disclosed herein include attachment mechanisms configured to be employed to attach a rear housing section to a fiber optic housing, and related assemblies and methods. The rear housing section and the fiber optic housing may be part of fiber optic equipment configured to support fiber optic connections of a fiber optic network. The attachment mechanism is configured to be attached and extend from the rear housing section of the fiber optic housing. The attachment mechanism may include a spring plunger which may releasably maintain the rear housing section in a position to allow fasteners to removably attach the rear housing section to the fiber optic housing. In this manner, the rear housing

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section may be attached to and removed from the fiber optic housing in an efficient manner to minimize downtime for the fiber optic network.

In one embodiment, a fiber optic equipment assembly is disclosed. The fiber optic equipment assembly may include an extension tray for a fiber optic housing. The fiber optic equipment assembly may also include an attachment mechanism extending from the extension tray. The attachment mechanism may be configured to removably attach the extension tray to the fiber optic housing. The attachment mechanism may comprise at least one spring plunger that releasably maintains the extension tray in a position to allow fasteners to removably attach the extension tray to the housing. In this manner, the extension tray may be removably and efficiently attached to the fiber optic housing.

In another embodiment, a method of adding fiber optic cable strain relief to a fiber optic housing is disclosed. The method may include providing a removable extension tray including an attachment mechanism. The attachment mechanism may comprise a flange with fastener holes and a spring plunger. Next, the method may also include fitting the extension tray to the housing by inserting the flange inside a side wall of the fiber optic housing. Next, the method may include retracting the spring plunger as the flange moves inside of the side wall. Next, the spring plunger may be extended into a spring plunger hole when the flange reaches a position where the spring plunger aligns with the spring plunger hole. In this manner, the attachment mechanism may easily align the extension tray to the fiber optic housing so that the fasteners may be efficiently installed.

In another embodiment, a method of upgrading a first rear housing section attached to a fiber optic housing is disclosed. The method may include providing a first rear housing section attached to fiber optic housing by an attachment mechanism. The attachment mechanism may extend from the first rear housing section. The attachment mechanism may comprise a flange with fastener holes and a spring plunger. Next, the method may include removing the rear housing section from the fiber optic housing by removing fasteners disposed through the side wall holes of a side wall of the fiber optic housing and fastener holes of a flange of the attachment mechanism. Next, the method may include retracting a spring plunger from a spring plunger hole of the fiber optic housing. Next, the method may include removing the flange from inside the side wall of the fiber optic housing. The method may also include attaching a second rear housing section to the fiber optic housing. In this manner, a second rear housing section having greater capacity than the first rear housing may be upgraded efficiently in the field to minimize fiber optic network downtime.

Additional features and advantages will be set forth in the detailed description which follows, and in part will be readily apparent to those skilled in the art from that description or recognized by practicing the embodiments as described herein, including the detailed description that follows, the claims, as well as the appended drawings.

It is to be understood that both the foregoing general description and the following detailed description present embodiments, and are intended to provide an overview or framework for understanding the nature and character of the disclosure. The accompanying drawings are included to provide a further understanding, and are incorporated into and constitute a part of this specification. The drawings illustrate various embodiments, and together with the description serve to explain the principles and operation of the concepts disclosed.

BRIEF DESCRIPTION OF THE FIGURES

FIG. 1 is a front perspective view of a first exemplary embodiment of fiber optic equipment including a housing and rear housing section installed on a fiber optic equipment rack, the housing supporting independently moveable fiber optic equipment trays and modules, and the rear housing section comprising an extension tray;

FIG. 2A is a rear, perspective view of the extension tray of FIG. 1 adjacent and unattached to the housing of FIG. 1 according to one embodiment;

FIG. 2B is a perspective, detail view of an attachment mechanism of the extension tray of FIG. 2A;

FIG. 3 is a rear, perspective partial view of the extension tray of FIG. 2A attached to the fiber optic housing;

FIG. 4A is a side view of a second embodiment of fiber optic equipment including the rear housing section of FIG. 1 attached to a 2U-sized fiber optic housing;

FIG. 4B is a side view of a third embodiment of fiber optic equipment including the fiber optic housing of FIG. 4A attached to a second example of a rear housing section;

FIG. 4C is a side view of a fourth embodiment of fiber optic equipment including the fiber optic housing of FIG. 4A attached to a third example of a rear housing section;

FIG. 4D is a side view of a fifth embodiment of fiber optic equipment including the fiber optic housing of FIG. 4A attached to a fourth example of a rear housing section.

FIG. 5 is an exemplary process of adding fiber optic cable strain relief to the fiber optic housing of FIG. 2A; and

FIG. 6 is an exemplary process of upgrading the fiber optic equipment of FIG. 4A to the fiber optic equipment of FIG. 4B.

DETAILED DESCRIPTION

Reference is now made in detail to the present embodiments of the disclosure, examples of which are illustrated in the accompanying drawings. Whenever possible, identical or similar reference numerals are used throughout the drawings to refer to identical or similar parts. It should be understood that the embodiments disclosed herein are merely examples with each one incorporating certain benefits of the present disclosure. Various modifications and alterations may be made to the following examples within the scope of the present disclosure, and aspects of the different examples may be mixed in different ways to achieve yet further examples. Accordingly, the true scope of the disclosure is to be understood from the entirety of the present disclosure in view of, but not limited to, the embodiments described herein.

Embodiments disclosed herein include an attachment mechanism employed to attach a rear housing section to a fiber optic housing, and related assemblies and methods. The rear housing section and the fiber optic housing may be part of fiber optic equipment to support fiber optic connections of a fiber optic network. The attachment mechanism may extend from the rear housing section. The attachment mechanism may include a spring plunger which may releasably maintain the rear housing section in a position to allow fasteners to removably attach the rear housing section to the housing. In this manner, the rear housing section may be attached and removed from the fiber optic housing in an efficient manner to minimize downtime for the fiber optic network.

In this regard, FIG. 1 illustrates exemplary fiber optic equipment 10(1). The exemplary fiber optic equipment 10(1) may be provided at a data distribution center or central office to support cable-to-cable fiber optic connections and to manage a plurality of fiber optic cable connections. The fiber optic equipment 10(1) includes a fiber optic housing 12 (“chassis”

or “housing 12”). The housing 12 is shown as being installed in a fiber optic equipment rack 14. The fiber optic equipment rack 14 contains two vertical rails 16A, 16B that extend vertically and include a series of apertures 18. The apertures 18 facilitate attachment of the fiber optic equipment 10(1) inside the fiber optic equipment rack 14. The fiber optic equipment 10(1) is attached and supported by the fiber optic equipment rack 14 in the form of shelves that are stacked on top of each other within the vertical rails 16A, 16B. As illustrated, the fiber optic equipment 10(1) is attached to the vertical rails 16A, 16B. The fiber optic equipment rack 14 may support 1U-sized shelves, any other U-size, with “U” equaling a standard 1.75 inches in height, or any other height desired.

As illustrated in FIG. 1 and discussed in greater detail below in this description, the fiber optic housing 12 includes a fiber optic equipment drawer 20 in this embodiment supporting one or more extendable fiber optic equipment trays 22. Providing the drawer 20 is not required. The fiber optic equipment trays 22 can be moved and extended from the fiber optic equipment drawer 20 and retracted back into the fiber optic equipment drawer 20. Any number of fiber optic equipment trays 22 can be provided. Each fiber optic equipment tray 22 supports one or more fiber optic modules 26 that each support one or more fiber optic connections. The view of the fiber optic modules in FIG. 1 is obstructed by a front chassis cover 24 placed in front of the fiber optic equipment drawer 20 as part of the fiber optic housing 12. The front chassis cover 24 may be attached to a rear chassis cover (not shown) to form a cover over the fiber optic housing 12. The fiber optic equipment drawer 20 is extendable out from the fiber optic housing 12 to access the fiber optic equipment trays 22 and the fiber optic modules 26 supported therein.

In the example of the fiber optic equipment 10(1) in FIG. 1, two fiber optic equipment trays 22 are supported by the fiber optic equipment drawer 20 with each fiber optic equipment tray 22 supporting four (4) fiber optic modules 26. Each fiber optic module 26 supports twelve (12) fiber optic connections. Thus, a total of up to ninety-six (96) fiber optic connections can be provided by the fiber optic equipment drawer 20, although the fiber optic equipment drawer 20 is not limited to this density.

As the drawer 20 is not limited to ninety-six (96) fiber optic connections, more fiber optic connections could be added over time as a demand for additional fiber optic capacity increases. A prerequisite for adding additional fiber optic connections is to provide adequate strain relief for the additional fiber optic cables that may enter and exit the fiber optic housing 12(1). Otherwise, without adequate strain relief, optical fiber damage and/or signal attenuation could occur. Additional strain relief may be added to the fiber optic housing 12(1) with an attachment of a rear housing section 28(1). Other examples of the rear housing sections 28(1) are also available to customize the fiber optic housing 12(1) for the specific fiber optic network requirements.

In this regard, FIG. 2A illustrates a perspective view of the rear housing section 28(1) detached from the chassis or housing 12(1). The rear housing section 28(1) may be an extension tray 30, as a non-limiting example. It should be understood that reference herein to “housing” shall mean, without limitation, chassis, enclosure and/or any type of structure that houses or encloses components, particularly optical components, optical fibers, cables and the like. The rear housing section 28(1) may be connected to the housing 12 with at least one attachment mechanism 34(1), 34(2), as described in more detail below.

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FIG. 2B illustrates a detail, perspective view of the attachment mechanism 34(1) extending from the extension tray 30 used to removably attach the extension tray 30 to the housing 12(1). In FIGS. 2A and 2B, the housing 12(1) is shown as a 1U-sized housing 12(1) as measured by height H_1 . However, it should be understood that the extension tray 30 may be used with and removably attach to any U-sized housing 12(1). Examples of non-1U-sized housing, for example 2U-sized housing 12(2)-12(5), are shown later in FIGS. 4A through 4D.

The extension tray 30 has a substantially flat, rectangular plate 36 comprising two major sides 38(1), 38(2) and two minor sides 40(1), 40(2). The attachment mechanisms 34(1), 34(2) in this embodiment attach to and extend from two opposite corners 42(1), 42(2), respectively, of one of the major sides 38(1), 38(2) of the plate 36. Trunk plates 46(1), 46(2) of the extension tray 30 may include strain relief receivers 48(1), 48(2) respectively. The trunk plates 46(1), 46(2) may be positioned on the plate 36. The plate 36 may also include strain relief receivers 48(3). The strain relief receivers 48(1)-48(3) may be configured to receive fasteners, such as tie wraps, cable clamps and the like, which may be used to attach fiber optic cables, for example trunk cables (not shown), to at least one of the trunk plates 46(1), 46(2) and to provide strain relief for the fiber optic cables.

With continuing reference to FIG. 2B, the attachment mechanism 34(1) on the corner 42(1) is shown in detail. The attachment mechanism 34(1) provides the ability for the rear housing section 28(1) to be easily configured in the field with a single technician. There is no need for a second technician to assist with the rear housing section 28(1) attachment because the single technician may easily align the rear housing section 28(1) to the fiber optic housing 12(1) with the attachment mechanism 34(1), 34(2). The attachment mechanism 34(1) includes a flange 50 with fastener holes 52 and spring plunger 54. The extension tray 30 may be fitted to the housing 12(1) by, as a non-limiting example, inserting the flange 50 inside of a side wall 56(1) of the housing 12(1). The spring plunger 54 retracts as the flange 50 moves inside of the side wall 56(1). When the flange 50 reaches a position 57 (see FIG. 3) where the spring plunger 54 aligns with the spring plunger hole 58, the biasing force of the spring on the spring plunger 54 extends the spring plunger 54 into the spring plunger hole 58. At this point, the fastener holes 52 align with side wall holes 60. The spring plunger 54 releasably maintains the extension tray 30 in the position 57 to allow fasteners 62 to be inserted through the side wall holes 60 into the fastener holes 52 to removably attach the extension tray 30 to the housing 12(1). The fasteners 62 may further support the rear housing section 28(1) with respect to the fiber optic housing 12(1) and resist torsional forces that may be caused by, for example, fiber optic cable strain that may pull the rear housing section 28(1) from the fiber optic housing 12(1). The fasteners 62 may be, for example, screws or other suitable fasteners. As a non-limiting example, the fasteners 62 may be #6-32x188 screws.

The attachment mechanism 34(2) on the corner 42(2) of the rear housing section 28(1) may have similar components and, accordingly, the discussion with respect to the attachment mechanism 34(1) at the corner 42(1) may apply to the attachment mechanism 34(2) at the corner 42(2). In this regard, as shown in FIG. 3, the attachment mechanism 34(2) at the corner 42(2) may be similarly fastened to the inside of a side wall 56(2) of the housing 12(1) to removably attach the extension tray 30 to the housing 12(1). In this manner, trunk cable strain relief parking positions may be added to or removed from a housing 12(1), including a different housing

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12(1) already installed or mounted to or in an equipment rack. In this manner, a user or technician may add parking at the time when additional parking is required without affecting the amount of U-space of the housing 12(1) or requiring the housing 12(1) to occupy any additional U-space or portion of U-space. The U-space may include a height of the fiber optic housing 12(1) and also the width of the housing 12(1). A standard width associated with a U-sized fiber optic housing 12(1) is either 19-inches or 23-inches. In other words, the housing 12(1) maintains the installed U-space the housing occupied prior to the extension tray 30 being removably attached to the housing 12(1). Additionally, the user may remove the additional trunk strain relief parking if the additional parking is not required. The extension tray 30 may be easily mounted to or dismounted from the housing 12(1) as the need requires.

Different sizes of the fiber optic housing 12(1) may be used with the rear housing section 28(1) and may be provided to accommodate different fiber optic housing sizes. For example, one-hundred ninety-two (192) fiber optic connections may be made with a 2U-sized fiber optic housing and thereby provide greater capacity of the fiber optic network compared with the 1U-sized housing 12(1) of FIG. 2A.

In this regard, FIG. 4A depicts a side view of a second embodiment of fiber optic equipment 10(2) including the rear housing section 28(1) attached to a second embodiment of a housing 12(2). The rear housing section 28(1) may be the same as the rear housing section 28(1) of the fiber optic equipment 10(1) in FIG. 2A. The housing 12(2) may be 2U-sized as measured by height H_2 shown in FIG. 4A. Despite this larger 2U-size of the fiber optic housing 12(1), the rear housing section 28(1) is an "open" design, meaning that a height of the rear housing section 12(1) does not extend to the height H_2 of the fiber optic housing 12(2) as will be shown in FIG. 4A. The rear housing section 28(1) may be attached to the housing 12(2) using at least one of the attachment mechanisms 34(1), 34(2) depicted in FIGS. 2A and 2B.

The fiber optic equipment 10(2) may include at least one of the attachment mechanisms 34(1), 34(2) as depicted in FIG. 2B which may each include the spring plunger 54 and fasteners 62, as well as aligning one of the spring plunger holes 58 and the side wall holes 60 respectively. The insertion procedure for attaching the rear housing section 28(1) to the housing 12(2) may be the same as the procedure used for the fiber optic equipment 10(1), as shown in FIG. 2B, because the at least one attachment mechanism 34(2) may be the same as the at least one attachment mechanism 34(1). The at least one attachment mechanism 34(1), 34(2) may be disposed between the side walls 56(1), 56(2) of the housing 12(2) to prevent an increase to the width of the housing 12(2) which may prevent a smooth installation or removal of the fiber optic equipment 10(2) onto or from the fiber optic equipment rack 14.

FIG. 4B shows a side view of a third embodiment of a fiber optic equipment 10(3) including the housing 12(2) of FIG. 4A attached to a second embodiment of a rear housing section 28(2). The rear housing section 28(2) may be, for example, a 2U-sized deep rear cover measured by the height H_2 . The rear housing section 28(2) may be attached to the housing 12(2) using at least one of the attachment mechanisms 34(1), 34(2) depicted in FIGS. 2A and 2B.

The fiber optic equipment 10(3) may include at least one of the attachment mechanisms 34(1), 34(2) as depicted in FIG. 2B which may each include the spring plunger 54 and fasteners 62, as well as corresponding one of the spring plunger hole 58 and the side wall holes 60 respectively. The insertion procedure for attaching the rear housing section 28(2) to the

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housing 12(2) may be the same as the procedure used for the fiber optic equipment 10(1) as shown in FIG. 2B because the at least one attachment mechanism 34(1), 34(2) may be the same. The at least one attachment mechanism 34(1), 34(2) may be disposed between the side walls 56(1), 56(2) of the housing 12(2) to prevent an increase to the width of the housing 12(2) which may prevent a smooth installation or removal of the fiber optic equipment 10(3) onto or from the fiber optic equipment rack 14.

FIG. 4C shows a side view of a fourth embodiment of a fiber optic equipment 10(4) including the housing 12(2) of FIG. 4A attached to a third embodiment of a rear housing section 28(3). The rear housing section 28(3) may be, for example, a 2U-sized splice rear cover measured by the height H_2 . The rear housing section 28(3) may be attached to the housing 12(2) using at least one of the attachment mechanisms 34(1), 34(2) depicted in FIGS. 2A and 2B.

The fiber optic equipment 10(4) may include at least one of the attachment mechanisms 34(1), 34(2) as depicted in FIG. 2B which may each include the spring plunger 54 and fasteners 62, as well as corresponding one of the spring plunger hole 58 and the side wall holes 60 respectively. The insertion procedure for attaching the rear housing section 28(3) to the housing 12(2) may be the same as the procedure used for the fiber optic equipment 10(1) as shown in FIG. 2B because the at least one attachment mechanism 34(1), 34(2) may be the same. The at least one attachment mechanism 34(1), 34(2) may be disposed between the side walls 56(1), 56(2) of the housing 12(2) to prevent an increase to the width of the housing 12(2) which may prevent a smooth installation or removal of the fiber optic equipment 10(4) onto or from the fiber optic equipment rack 14.

FIG. 4D shows a side view of a fifth embodiment of a fiber optic equipment 10(5) including the housing 12(2) of FIG. 4A attached to a fourth embodiment of a rear housing section 28(4). The rear housing section 28(4) may be, for example, a 2U-sized shallow rear cover measured by the height H_2 . The rear housing section 28(4) may be attached to the housing 12(2) using at least one of the attachment mechanisms 34(1), 34(2) depicted in FIGS. 2A and 2B.

The fiber optic equipment 10(5) may include at least one of the attachment mechanisms 34(1), 34(2) as depicted in FIG. 2B which may each include the spring plunger 54 and fasteners 62, as well as corresponding one of the spring plunger hole 58 and the side wall holes 60 respectively. The insertion procedure for attaching the rear housing section 28(4) to the housing 12(2) may be the same as the procedure used for the fiber optic equipment 10(1) as shown in FIG. 2B because the at least one attachment mechanism 34(1), 34(2) may be the same. The at least one attachment mechanism 34(1), 34(2) may be disposed between the side walls 56(1), 56(2) of the housing 12(2) to prevent an increase to the width of the housing 12(2) which may prevent a smooth installation or removal of the fiber optic equipment 10(5) onto or from the fiber optic equipment rack 14.

FIG. 5 is an exemplary process 64 of adding fiber optic cable strain relief receivers 48(1)-48(3) to the fiber optic housing 12(1) is disclosed in reference to the information discussed above and in reference to FIGS. 2A through 3. The process 64 in FIG. 5 will be described using the terminology and information provided above. The first step of the process 64 may comprise providing the removable rear housing section 28(1) including the at least one attachment mechanism 34(1), 34(2) (step 66 in FIG. 5). Each of the attachment mechanism 34(1), 34(2) may comprise the flange 50 with the fastener holes 52 and the spring plunger 54.

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Next, the process 64 may comprise fitting the rear housing section 28(1) to the fiber optic housing 12(1) by inserting the flange 50 inside the side wall 56(1), 56(2) of the fiber optic housing 12(1) (step 68 in FIG. 5). The flange 50 is inserted in an interior of the fiber optic housing 12(1) when it is inserted inside the side wall 56(1), 56(2). Next, the process 64 may comprise retracting the spring plunger 54 as the flange 50 moves inside of the side wall 56(1), 56(2) (step 70 in FIG. 5). The process 64 may also comprise extending the spring plunger 54 into the spring plunger hole 58 when the flange 50 reaches the position 57 (see FIG. 3) where the spring plunger 54 aligns with the spring plunger hole 58 (step 72 in FIG. 5). The biasing force of the spring 55 on the spring plunger 54 extends the spring plunger 54 into the spring plunger hole 58.

Next, the process 64 may further include removably attaching the rear housing section 28(1) to the fiber optic housing 12(1) by inserting the fasteners 62 through the side wall holes 60 of at least one of the side wall 56(1), 56(2) of the fiber optic housing 12(1) and into the fastener holes 52 of the attachment mechanism 34(1), 34(2) (step 74 in FIG. 5). It is noted that the removably attaching the rear housing section 28(1) may further comprise aligning the fastener holes 52 with the side wall holes 60 while the spring plunger 54 releasably maintains the rear housing section 28(1) in the position 57 (see FIG. 3) to thereby allow the fasteners 62 to be inserted through the side wall holes 60 and into the fastener holes 52.

FIG. 6 is an exemplary second process 76 of upgrading the first rear housing section 28(1) attached to the fiber optic housing 12(1) also disclosed in reference to the information discussed above and in reference to FIGS. 4A and 4B with reference to the detailed components in FIGS. 2A through 3. The process in FIG. 6 will be described using the terminology and information provided above. The first step of the second process 76 may include providing the first rear housing section 28(1) (See FIG. 4A) (step 78 in FIG. 6) attached to the fiber optic housing 12(2) by the at least one attachment mechanism 34(1), 34(2). The at least one attachment mechanism 34(1), 34(2) may extend from the first rear housing section 28(1). The attachment mechanism 34(1), 34(2) may include the flange 50 with fastener holes 52 and the spring plunger 54.

Next, the second process 76 may include removing the first rear housing section 28(1) from the fiber optic housing 12(2) (step 80 in FIG. 6). The first rear housing section 28(1) may be removed by removing the fasteners 62 disposed through the side wall holes 60 of the side wall 56(1), 56(2) of the fiber optic housing 12(2) and the fastener holes 52 of the flange 50 of the attachment mechanism 34(1), 34(2).

Next, the second process 76 may comprise retracting the spring plunger 54 from the spring plunger hole 58 of the fiber optic housing 12(2) (step 82 in FIG. 6). The second process 76 may also include removing the flange 50 from inside the side wall 56(1), 56(2) of the fiber optic housing 12(1) (step 84 in FIG. 6). Then, the second process 76 may include attaching the second rear housing section 28(2) to the fiber optic housing 12(2). The second rear housing section 28(2) may be an upgrade to the first rear housing section 28(1).

Attaching the second rear housing section 28(2) as part of the second process (step 78 in FIG. 6) may include fitting the second rear housing section 28(2) to the fiber optic housing 12(2) by inserting the second flange 50 of the second attachment mechanism 34(1), 34(2) inside the side wall 56(1), 56(2) of the fiber optic housing 12(2) (step 86 in FIG. 6). The second attachment mechanism 34(1), 34(2) may extend from the second rear housing section 28(2). Next, the second process 76 may include retracting the second spring plunger 54 of the

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second rear housing section 28(2) as the second flange 50 moves inside of the side wall 56(1), 56(2) (step 88 in FIG. 6).

Next, the second process 76 may include extending the second spring plunger 54 into the spring plunger hole 58 of the fiber optic housing 12(2) when the second flange 50 reaches the position 57 where the second spring plunger 54 aligns with the spring plunger hole 58 (step 90 in FIG. 6). The biasing force of the spring 55 on the second spring plunger 54 may extend the second spring plunger 54 into the spring plunger hole 58.

The second process 76 may also include removably attaching the second rear housing section 28(2) to the fiber optic housing 12(2) by inserting the fasteners 62 through the side wall holes 60 and into the fastener holes 52 of the second attachment mechanism 34(1), 34(2) (step 92 in FIG. 6). The fasteners 62 may be inserted with ease when the second spring plunger 54 releasably maintains the second rear housing section 28(2) in the position 57. In this position 57, the fastener holes 52 may be aligned with the side wall holes 60 thereby allowing the fasteners 62 to be inserted with ease.

As used herein, it is intended that terms “fiber optic cables” and/or “optical fibers” include all types of single mode and multi-mode light waveguides, including one or more optical fibers that may be up-coated, colored, buffered, ribbonized and/or have other organizing or protective structure in a cable such as one or more tubes, strength members, jackets or the like. The optical fibers disclosed herein can be single mode or multi-mode optical fibers. Likewise, other types of suitable optical fibers include bend-insensitive optical fibers, or any other expedient of a medium for transmitting light signals. An example of a bend-insensitive, or bend resistant, optical fiber is ClearCurve® Multimode fiber commercially available from Corning Incorporated. Suitable fibers of this type are disclosed, for example, in U.S. Patent Application Publication Nos. 2008/0166094 and 2009/0169163, the disclosures of which are incorporated herein by reference in their entireties.

Many modifications and other embodiments not set forth herein will come to mind to one skilled in the art to which the embodiments pertain having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Therefore, it is to be understood that the description and claims are not to be limited to the specific embodiments disclosed and that modifications and other embodiments are intended to be included within the scope of the appended claims. It is intended that the embodiments cover the modifications and variations of the embodiments provided they come within the scope of the appended claims and their equivalents. Although specific terms are employed herein, they are used in a generic and descriptive sense only and not for purposes of limitation.

What is claimed is:

1. A fiber optic equipment assembly, comprising:
a rear housing section for a fiber optic housing; and
an attachment mechanism extending from the rear housing section, the attachment mechanism configured to removably attach the rear housing section to the fiber optic housing, wherein the attachment mechanism comprises at least one spring plunger configured to releasably maintain the rear housing section in a position to allow fasteners to removably attach the rear housing section to the fiber optic housing, and wherein the housing maintains an installed U-space the housing occupied prior to the rear housing section being removably attached to the housing.

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2. The fiber optic equipment assembly of claim 1, wherein the attachment mechanism comprises a flange, and the spring plunger extends through the flange.

3. The fiber optic equipment assembly of claim 2, wherein the flange comprises fastener holes for receiving the fasteners.

4. The fiber optic equipment assembly of claim 1, wherein the attachment mechanism is inserted inside a side wall of the housing.

5. The fiber optic equipment assembly of claim 1, wherein the rear housing section comprises a substantially flat, rectangular plate.

6. The fiber optic equipment assembly of claim 5, wherein the plate comprises two major sides and two minor sides.

7. The fiber optic equipment assembly of claim 6, wherein the attachment mechanism attaches to and extends from opposite corners of one of the major sides.

8. The fiber optic equipment assembly of claim 5, further comprising at least one trunk plate including strain relief receivers positioned on the substantially flat, rectangular plate.

9. The fiber optic equipment assembly of claim 8, wherein the strain relief receivers are configured to receive fasteners, the fasteners being one or more of tie wraps and cable clamps, and the fasteners are used to attach fiber optic cables to the trunk plate.

10. The fiber optic equipment assembly of claim 1, wherein the rear housing section is an extension tray.

11. The fiber optic equipment assembly of claim 1, wherein the rear housing section is a 2U-sized rear cover.

12. A method of adding a housing section to a fiber optic housing, comprising:

providing a removable rear housing section including an attachment mechanism, the attachment mechanism comprising a flange with fastener holes and a spring plunger;

fitting the rear housing section to the fiber optic housing by inserting the flange inside a side wall of the fiber optic housing;

retracting the spring plunger as the flange moves inside of the side wall; and

extending the spring plunger into a spring plunger hole when the flange reaches a position where the spring plunger aligns with the spring plunger hole, wherein the housing maintains an installed U-space the housing occupied prior to the rear housing section being fitted to the housing.

13. The method of claim 12, wherein a biasing force of a spring on the spring plunger extends the spring plunger into the spring plunger hole.

14. The method of claim 12, further comprising removably attaching the rear housing section to the fiber optic housing by inserting fasteners through side wall holes of the side wall of the fiber optic housing and into the fastener holes of the attachment mechanism.

15. The method of claim 14, wherein the removably attaching the rear housing section further comprises aligning the fastener holes with the side wall holes while the spring plunger releasably maintains the rear housing section in a position allowing fasteners to be inserted through the side wall holes and into the fastener holes.

16. A method of upgrading a first rear housing section attached to a fiber optic housing, comprising:

providing a first rear housing section attached to fiber optic housing by an attachment mechanism extending from

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the first rear housing section, the attachment mechanism comprising a flange with fastener holes and a spring plunger;
 removing the first rear housing section from the fiber optic housing by removing fasteners disposed through side wall holes of a side wall of the fiber optic housing and fastener holes of a flange of the attachment mechanism; retracting the spring plunger from a spring plunger hole of the fiber optic housing;
 removing the flange of the first rear housing section from inside the side wall of the fiber optic housing; and
 attaching a second rear housing section to the fiber optic housing.
 17. The method of claim 16, wherein the attaching the second rear housing section comprises:
 fitting the second rear housing section to the fiber optic housing by inserting a second flange of a second attachment mechanism inside the side wall of the fiber optic housing, the second attachment mechanism extends from the second rear housing section;
 retracting a second spring plunger of the second rear housing section as the second flange moves inside of the side wall; and

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extending the second spring plunger into the spring plunger hole when the second flange reaches a position where the second spring plunger aligns with the spring plunger hole.

18. The method of claim 17, wherein a biasing force of a spring on the second spring plunger extends the second spring plunger into the spring plunger hole.

19. The method of claim 17, further comprising removably attaching the second rear housing section to the fiber optic housing by inserting fasteners through the side wall holes and into fastener holes of the second attachment mechanism.

20. The method of claim 19, wherein the removably attaching the second rear housing section further comprises aligning the fastener holes of the second attachment mechanism with the side wall holes while the second spring plunger releasably maintains the second rear housing section in a position allowing fasteners to be inserted through the side wall holes and into the fastener holes of the second attachment mechanism.

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