U.S. PATENT DOCUMENTS

| 3,870,033 A 3/1975 Faylor et al. 126/360 R 3,953,580 A 4/1976 Allen et al. 423/283 3,964,999 A 6/1976 Chisdes 210/27 4,182,676 A 1/1980 Casolo 210/27 4,182,676 A 1/1980 Weiegert 210/670 4,321,145 A 3/1982 Carlson 210/678 4,430,226 A 2/1984 Hegde et al. 210/638 4,434,057 A * 2/1984 Marquardt 4,532,045 A 7/1985 Dubin 210/698 4,548,716 A 10/1985 Boeve 210/652 4,574,049 A * 3/1986 Pittner 210/639 4,698,153 A 10/1987 Matsuzaki et al. 210/638 4,820,421 A 4/1989 Cadotte et al. 210/638 4,900,450 A 2/1990 Schmidt 210/679 4,917,806 A 4/1990 Matsunaga et al. 210/639 4,995,20 A 11/1990 Jan et al. 166/266 4,995,983 A 2/1991 Eadie et al. 210/639 5,028,336 A 7/1991 Bartels et al. 210/638 5,073,268 A * 12/1991 Saito et al. 210/638 5,236,722 A 8/1993 Schroeder 426/67 5,246,586 A 9/1993 Ban et al. 210/638 5,246,589 A * 9/1993 Ban et al. 210/638 5,246,589 A * 9/1993 Ban et al. 210/638 5,246,580 A 9/1994 Worita et al. 210/638 5,246,580 A 9/1994 Worita et al. 210/638 5,338,456 A 8/1994 Stivers 210/638 5,338,456 A 8/1994 Stivers 210/638 5,338,456 A 8/1994 Stivers 210/638 5,338,456 A 8/1995 Oinuma et al. 210/639 5,557,3662 A 11/1996 Obata et al. 210/639 5,552,668 A 1/1995 Green 210/638 5,573,666 A 1/1996 Obata et al. 210/639 5,573,666 A 11/1996 Worin 210/232 5,571,419 A 11/1996 Obata et al. 210/639 5,645,727 A 7/1997 Bhave et al. 210/651 5,645,727 A 7/1997 Bhave et al. 210/652 5,664,739 A 1/1999 Frandt et al. 210/651 5,695,643 A 1/1997 Frandt et al. 210/652 5,664,739 A 1/1999 Frandt et al. 210/652 5,766,479 A * 6/1998 Collentro et al. 210/652 5,666,7891 B1 7/2001 Tonelli et al. | 3,721,621 | Δ | | 3/1973 | Hough 210/22 |
|---|-----------|------------|---|---------|----------------------------|
| 3,953,580 A 4/1976 Allen et al. 423/283 3,964,999 A 6/1976 Chisdes 210/23 R 3,985,648 A 10/1976 Casolo 210/27 4,182,676 A 1/1980 Casolo 210/27 4,235,715 A * 11/1980 Weiegert 210/670 4,321,145 A 3/1982 Carlson 210/678 4,430,226 A 2/1984 Hegde et al. 210/638 4,434,057 A * 2/1984 Marquardt 4,532,045 A 7/1985 Littmann 210/688 4,548,716 A 10/1985 Boeve 210/652 4,574,049 A * 3/1986 Pittner 210/639 4,698,153 A 10/1987 Matsuzaki et al. 210/638 4,820,421 A 4/1989 Auerswald 210/654 4,824,574 A 4/1989 Cadotte et al. 210/679 4,917,806 A 4/1990 Matsunaga et al. 210/654 4,995,520 A 11/1990 Jan et al. 166/266 4,995,933 A 2/1991 Eadie et al. 210/639 5,028,336 A 7/1991 Bartels et al. 210/638 5,073,268 A * 12/1991 Saito et al. 210/638 5,073,268 A * 12/1991 Saito et al. 210/638 5,174,901 A 12/1992 Smith 210/638 5,246,589 A * 9/1993 Ban et al. 210/638 5,246,589 A * 9/1993 Ban et al. 210/638 5,224,339 A 3/1994 Morita et al. 210/638 5,233,3456 A 8/1994 Sivers 210/638 5,338,456 A 8/1994 Sivers 210/638 5,535,2345 A * 10/1994 Byszewski et al. 210/638 5,535,3345 A * 10/1994 Byszewski et al. 210/638 5,535,3366 A 1/1999 Ban et al. 210/638 5,535,336,40 A 10/1994 Byszewski et al. 210/638 5,573,662 A 1/1995 Green 210/638 5,573,666 A 1/1996 Obata et al. 210/638 5,573,666 A 1/1997 Brandt et al. 210/638 5,573,666 A 1/1996 Obata et al. 210/638 5,573,662 A 1/1997 Brandt et al. 210/638 5,573,664 A 1/1997 Brandt et al. 210/651 5,695,643 A * 9/1998 Klamizov et al. 5,925,255 A * 7/1999 Mukhopadhay 210/652 | | | | | |
| 3,964,999 A 6/1976 Chisdes 210/23 R 3,985,648 A 10/1976 Casolo 210/27 4,182,676 A 1/1980 Casolo 210/27 4,235,715 A * 11/1980 Weiegert 210/678 4,321,145 A 3/1982 Carlson 210/678 4,430,226 A 2/1984 Hegde et al. 210/638 4,434,057 A * 2/1984 Marquardt 4,532,045 A 7/1985 Littmann 210/668 4,532,045 A 7/1985 Dubin 210/652 4,574,049 A * 3/1986 Pittner 210/639 4,698,153 A 10/1987 Matsuzaki et al. 210/638 4,820,421 A 4/1989 Auerswald 210/674 4,824,574 A 4/1989 Carlson 210/654 4,900,450 A 2/1990 Schmidt 210/679 4,917,806 A 4/1990 Matsunaga et al. 210/662 4,969,520 A 11/1990 Jan et al. 166/266 4,995,983 A 2/1991 Eadie et al. 210/639 5,028,336 A 7/1991 Bartels et al. 210/638 5,073,268 A * 12/1991 Saito et al. 210/638 5,174,901 A 12/1992 Smith 210/638 5,174,901 A 12/1992 Smith 210/638 5,236,722 A 8/1993 Schroeder 426/67 5,246,586 A 9/1993 Ban et al. 210/638 5,246,589 A * 9/1993 Ban et al. 210/638 5,246,589 A * 9/1993 Ban et al. 210/638 5,250,185 A 10/1994 Bartels et al. 210/638 5,250,185 A 10/1994 Byszewski et al. 210/638 5,338,456 A 8/1994 Worita et al. 210/638 5,338,456 A 8/1994 Schroeder 426/67 5,345,540 A 10/1994 Zeiher et al. 210/638 5,338,5640 A 10/1994 Zeiher et al. 210/638 5,573,662 A 1/1996 Obata et al. 210/638 5,573,666 A 1/1996 Obata et al. 210/651 5,695,643 A 9/1997 Bhave et al. 210/652 5,576,479 A * 6/1998 Collentro et al. 210/652 5,645,727 A 7/1997 Bhave et al. 210/652 5,645,727 A 7/1997 Bhave et al. 210/652 5,645,727 A 7/1997 Bhave et al. 210/652 5,645,727 A 7/1997 Brandt et al. 210/652 5,645,727 A 7/1999 Brandt et al. 210/654 5,695,643 A 9/1998 Klamizov et al. 5,925,25,255 A * 7/1999 Mukhopadhay 210/652 | | | | , | |
| 3,985,648 A 10/1976 Casolo 210/27 4,182,676 A 1/1980 Casolo 210/27 4,235,715 A * 11/1980 Weiegert 210/670 4,321,145 A 3/1982 Carlson 210/678 4,430,226 A 2/1984 Hegde et al. 210/638 4,434,057 A * 2/1984 Marquardt 4,532,047 A 7/1985 Dubin 210/668 4,534,071 A 10/1985 Boeve 210/652 4,574,049 A * 3/1986 Pittner 210/638 4,698,153 A 10/1987 Matsuzaki et al. 210/638 4,820,421 A 4/1989 Auerswald 210/670 4,824,574 A 4/1989 Cadotte et al. 210/670 4,904,95,20 A 1/1990 Schmidt 210/679 4,917,806 A 4/1989 Matsunaga et al. 210/679 4,995,983 A 2/1990 Schmidt 210/639 5,028,336 A 7/1991 Bartels et al. 210/639 5,061,374 A 10/1991 Lewis 210/638 5,174,901 A 12/1992 Smith 210/638 5,174,901 A 12/1992 Smith 210/638 5,246,586 | | | | | |
| 4,182,676 A 1/1980 Casolo 210/27 4,235,715 A * 11/1980 Weiegert 210/670 4,321,145 A 3/1982 Carlson 210/678 4,430,226 A 2/1984 Hegde et al. 210/638 4,434,057 A * 2/1984 Marquardt 4,532,045 A 7/1985 Dubin 210/668 4,532,047 A 7/1985 Dubin 210/698 4,548,716 A 10/1985 Boeve 210/652 4,574,049 A * 3/1986 Pittner 210/639 4,698,153 A 10/1987 Matsuzaki et al. 210/639 4,698,153 A 7/1988 Grinstead 210/639 4,820,421 A 4/1989 Auerswald 210/670 4,824,574 A 4/1989 Cadotte et al. 210/670 4,917,806 A 4/1990 Matsunaga et al. 210/679 4,917,806 A 4/1990 Matsunaga et al. 210/639 5,061,374 A 10/1991 Eadie et al. 210/639 5,028,336 A 7/1991 Bartels et al. 210/638 5,174,901 A 12/1992 Smith 210/638 5,174,901 A 12/1992 Smith 210/638 5,246,586 A 9/1993 Ban et al. 210/638 5,246,586 A 9/1993 Ban | | | | , | |
| 4,235,715 A * 11/1980 Weiegert 210/670 4,321,145 A 3/1982 Carlson 210/678 4,430,226 A 2/1984 Hegde et al. 210/638 4,434,057 A * 2/1984 Marquardt 4,532,045 A 7/1985 Littmann 210/668 4,532,047 A 7/1985 Dubin 210/698 4,548,716 A 10/1985 Boeve 210/652 4,574,049 A * 3/1986 Pittner 210/639 4,698,153 A 10/1987 Matsuzaki et al. 210/639 4,829,421 A 4/1989 Auerswald 210/639 4,824,574 A 4/1989 Cadotte et al. 210/654 4,900,450 A 2/1990 Schmidt 210/669 4,995,983 A 2/1991 Eadie et al. 210/639 5,061,374 A 10/1991 Lewis 210/639 5,073,268 A * 12/1991 Saito et al. 210/638 5,174,901 A 12/1992 Smith 210/638 5,246,586 A 9/1993 Ban et al. 210/638 5,246,586 A 9/1993 Ban et al. 210/638 5,2352,345 A * 10/1994 Byszewski et al. 210/638 | | | | | |
| 4,321,145 A | | | * | , | |
| 4,430,226 A 2/1984 Hegde et al. 210/638 4,434,057 A * 2/1984 Marquardt 4,532,045 A 7/1985 Littmann 210/668 4,532,047 A 7/1985 Dubin 210/652 4,548,716 A 10/1985 Boeve 210/652 4,574,049 A * 3/1986 Pittner 210/639 4,698,153 A 10/1987 Matsuzaki et al. 210/62 4,755,298 A 7/1988 Grinstead 210/638 4,820,421 A 4/1989 Auerswald 210/670 4,824,574 A 4/1989 Cadotte et al. 210/670 4,917,806 A 4/1990 Matsunaga et al. 210/679 4,917,806 A 4/1990 Matsunaga et al. 210/639 5,028,336 A 7/1991 Bartels et al. 210/639 5,028,336 A 7/1991 Bartels et al. 210/638 5,73,268 A * 12/1991 Saito et al. 210/638 5,246,586 A 9/1993 Ban et al. 210/638 5,246,586 A 9/1993 Ban et al. 210/638 5,250,185 A 10/1994 Tao et al. 210/638 5,338,5664 A 10/1994 Morita et al. 210/638 <td></td> <td></td> <td></td> <td></td> <td></td> | | | | | |
| 4,434,057 A * 2/1984 Marquardt 4,532,045 A 7/1985 Littmann 210/668 4,532,047 A 7/1985 Dubin 210/698 4,548,716 A 10/1985 Boeve 210/639 4,574,049 A * 3/1986 Pittner 210/639 4,698,153 A 10/1987 Matsuzaki et al. 210/638 4,820,421 A 4/1989 Grinstead 210/670 4,824,574 A 4/1989 Cadotte et al. 210/670 4,917,806 A 4/1990 Matsunaga et al. 210/662 4,995,983 A 2/1990 Schmidt 210/639 5,028,336 A 7/1991 Bartels et al. 210/639 5,028,336 A 7/1991 Bartels et al. 210/638 5,073,268 A * 12/1991 Ewis 210/638 5,174,901 A 12/1992 Smith 210/638 5,246,586 A 9/1993 Ban et al. 210/638 5,246,586 A 9/1993 Ban et al. 210/638 5,250,185 A 10/1991 Tao et al. 210/638 5,335,2345 A * 10/1994 Morita et al. 210/638 5,352,345 A * 10/1994 Morita et al. 210/638 | | | | | |
| 4,532,045 A 7/1985 Dubin 210/668 4,532,047 A 7/1985 Dubin 210/698 4,548,716 A 10/1985 Boeve 210/652 4,574,049 A * 3/1986 Pittner 210/632 4,698,153 A 10/1987 Matsuzaki et al. 210/192 4,755,298 A 7/1988 Grinstead 210/638 4,820,421 A 4/1989 Auerswald 210/670 4,824,574 A 4/1989 Cadotte et al. 210/679 4,917,806 A 4/1990 Matsunaga et al. 210/662 4,995,983 A 2/1991 Eadie et al. 210/639 5,028,336 A 7/1991 Bartels et al. 210/639 5,061,374 A 10/1991 Lewis 210/638 5,736,722 A 8/1991 Saito et al. 210/638 5,246,586 A 9/1993 Ban et al. 210/638 5,246,586 A 9/1993 Ban et al. 210/638 5,250,185 A 10/1993 Mukhopadhyay et al. 210/638 5,352,345 A * 10/1994 Byszewski et al. 210/638 5,352,345 A * 10/1994 Byszewski et al. 210/638 5,376,64 A 1/1995 Oinuma et al | | | * | | |
| 4,532,047 A 7/1985 Dubin 210/698 4,548,716 A 10/1985 Boeve 210/652 4,574,049 A * 3/1986 Pittner 210/639 4,698,153 A 10/1987 Matsuzaki et al. 210/632 4,755,298 A 7/1988 Grinstead 210/638 4,820,421 A 4/1989 Auerswald 210/670 4,824,574 A 4/1989 Cadotte et al. 210/679 4,917,806 A 2/1990 Schmidt 210/679 4,995,920 A 11/1990 Jan et al. 166/266 4,995,983 A 2/1991 Eadie et al. 210/639 5,028,336 A 7/1991 Bartels et al. 210/638 5,073,268 A * 12/1991 Saito et al. 210/638 5,174,901 A 12/1992 Smith 210/638 5,246,586 A 9/1993 Ban et al. 210/638 5,246,586 A 9/1993 Ban et al. 210/638 5,250,185 A 10/1993 Tao et al. 210/638 5,252,343 A * 10/1993 Mukhopadhyay et al. 210/638 5,338,456 A 8/1994 Stivers 210/638 5,352,345 A * 10/1994 Byszewski et al. | | | | | |
| 4,548,716 A 10/1985 Boeve 210/652 4,574,049 A * 3/1986 Pittner 210/639 4,698,153 A 10/1987 Matsuzaki et al. 210/192 4,755,298 A 7/1988 Grinstead 210/638 4,820,421 A 4/1989 Auerswald 210/654 4,824,574 A 4/1989 Cadotte et al. 210/679 4,900,450 A 2/1990 Schmidt 210/662 4,995,983 A 2/1991 Eadie et al. 210/639 5,028,336 A 7/1991 Bartels et al. 210/639 5,073,268 A * 12/1991 Lewis 210/638 5,174,901 A 12/1992 Smith 210/638 5,174,901 A 12/1992 Smith 210/638 5,246,586 A 9/1993 Ban et al. 210/638 5,246,586 A 9/1993 Ban et al. 210/638 5,250,185 A 10/1993 Tao et al. 210/638 5,2352,345 A * 10/1993 Mukhopadhyay et al. 210/638 5,352,345 A * 10/1994 Byszewski et al. 210/638 5,355,640 A 10/1994 Veiter et al. 210/639 5,376,664 A 11/1996 Obata et al. | | | | | · |
| 4,574,049 A * 3/1986 Pittner 210/639 4,698,153 A 10/1987 Matsuzaki et al. 210/192 4,755,298 A 7/1988 Grinstead 210/638 4,820,421 A 4/1989 Auerswald 210/670 4,824,574 A 4/1989 Cadotte et al. 210/679 4,900,450 A 2/1990 Schmidt 210/6679 4,917,806 A 4/1990 Matsunaga et al. 210/662 4,995,983 A 2/1991 Eadie et al. 210/639 5,028,336 A 7/1991 Bartels et al. 210/639 5,073,268 A 12/1991 Lewis 210/638 5,174,901 A 12/1992 Smith 210/638 5,174,901 A 12/1992 Smith 210/638 5,246,589 A 9/1993 Ban et al. 210/638 5,246,589 A 9/1993 Ban et al. 210/638 5,292,439 A< | | | | | |
| 4,698,153 A 10/1987 Matsuzaki et al. 210/192 4,755,298 A 7/1988 Grinstead 210/638 4,820,421 A 4/1989 Auerswald 210/670 4,824,574 A 4/1989 Cadotte et al. 210/654 4,900,450 A 2/1990 Schmidt 210/654 4,990,450 A 2/1990 Matsunaga et al. 210/652 4,991,806 A 4/1990 Matsunaga et al. 210/662 4,995,983 A 2/1991 Eadie et al. 210/639 5,028,336 A 7/1991 Bartels et al. 210/639 5,073,268 A * 12/1991 Saito et al. 210/638 5,174,901 A 12/1992 Smith 210/638 5,246,586 A 9/1993 Ban et al. 210/638 5,246,589 A * 10/1993 Tao et al. 210/638 5,292,439 A 3/1994 Morita et al. 210/638 5,33 | | | * | | · |
| 4,755,298 A 7/1988 Grinstead 210/638 4,820,421 A 4/1989 Auerswald 210/670 4,824,574 A 4/1989 Cadotte et al. 210/654 4,900,450 A 2/1990 Schmidt 210/6679 4,917,806 A 4/1990 Matsunaga et al. 210/6626 4,969,520 A 11/1990 Jan et al. 166/266 4,995,983 A 2/1991 Eadie et al. 210/639 5,028,336 A 7/1991 Bartels et al. 210/639 5,073,268 A * 12/1991 Lewis 210/638 5,073,268 A * 12/1992 Smith 210/638 5,174,901 A 12/1992 Smith 210/638 5,246,586 A 9/1993 Ban et al. 210/638 5,246,586 A 9/1993 Ban et al. 210/638 5,250,185 A 10/1993 Tao et al. 210/638 5,338,456 A 8/1994 Morita et al. 210/638 5,338,566 A 10/1994 Byszewski et al. 210/638 5,359,689 A 6/1996 Korin 210/639 5,573,662 A 1/1995 Oinuma et al. 210/638 5,573,662 A 11/1996 Obata et al. < | | | | | • |
| 4,820,421 A 4/1989 Auerswald 210/670 4,824,574 A 4/1989 Cadotte et al. 210/654 4,900,450 A 2/1990 Schmidt 210/679 4,917,806 A 4/1990 Matsunaga et al. 210/626 4,969,520 A 11/1990 Jan et al. 210/639 5,028,336 A 7/1991 Eadie et al. 210/639 5,061,374 A 10/1991 Lewis 210/638 5,073,268 A * 12/1991 Saito et al. 210/638 5,174,901 A 12/1992 Smith 210/638 5,246,586 A 9/1993 Ban et al. 210/638 5,246,586 A 9/1993 Ban et al. 210/638 5,250,185 A 10/1993 Tao et al. 210/638 5,252,439 A 3/1994 Morita et al. 210/638 5,338,456 A * 10/1994 Byszewski et al. 210/638 5,358,640 A 10/1994 Byszewski et al. 210/638 5,359,684 A 10/1994 Green 210/638 5,376,650 A 11/1995 Oinuma et al. 210/638 5,579,689 A 6/1996 Korin 210/638 5,573,666 A 11/1996 Korin <t< td=""><td></td><td></td><td></td><td></td><td>•</td></t<> | | | | | • |
| 4,824,574 A 4/1989 Cadotte et al. 210/654 4,900,450 A 2/1990 Schmidt 210/679 4,917,806 A 4/1990 Matsunaga et al. 210/662 4,969,520 A 11/1990 Jan et al. 166/266 4,995,983 A 2/1991 Eadie et al. 210/639 5,028,336 A 7/1991 Bartels et al. 210/638 5,073,268 A * 10/1991 Lewis 210/638 5,174,901 A 12/1992 Smith 210/658 5,236,722 A 8/1993 Schroeder 426/67 5,246,586 A 9/1993 Ban et al. 210/638 5,246,586 A 9/1993 Ban et al. 210/638 5,250,185 A 10/1993 Tao et al. 210/638 5,292,439 A 3/1994 Morita et al. 210/638 5,338,456 A 8/1994 Stivers 210/638 5,352,345 A * 10/1994 Byszewski et al. 2,385,664 A 5,385,664 A 1/1995 Oinuma et al. 210/639 5,571,419 A 11/1996 Korin 210/638 5,573,662 A 11/1996 Korin 210/232 5,573,666 A 11/1996 Korin 210/ | | | | | |
| 4,900,450 A 2/1990 Schmidt 210/679 4,917,806 A 4/1990 Matsunaga et al. 210/662 4,995,920 A 11/1990 Jan et al. 166/266 4,995,983 A 2/1991 Eadie et al. 210/639 5,028,336 A 7/1991 Bartels et al. 210/638 5,013,74 A 10/1991 Lewis 210/638 5,073,268 A * 12/1991 Saito et al. 210/638 5,174,901 A 12/1992 Smith 210/652 5,236,722 A 8/1993 Schroeder 426/67 5,246,586 A 9/1993 Ban et al. 210/638 5,246,589 A * 9/1993 Ban et al. 210/638 5,250,185 A 10/1993 Tao et al. 210/638 5,250,185 A 10/1993 Mukhopadhyay et al. 210/638 5,338,456 A 8/1994 Morita et al. 210/638 5,352,345 A * 10/1994 Byszewski et al. 210/639 5,385,664 A 1/1995 Oinuma et al. 210/639 5,571,419 A 11/1996 Obata et al. 210/638 5,573,662 A 11/1996 Obata et al. 210/651 5,670,053 A * 9/1997 Col | | Α | | | |
| 4,917,806 A 4/1990 Matsunaga et al. 210/662 4,969,520 A 11/1990 Jan et al. 166/266 4,995,983 A 2/1991 Eadie et al. 210/639 5,028,336 A 7/1991 Bartels et al. 210/639 5,073,268 A * 12/1991 Lewis 210/638 5,174,901 A 12/1992 Smith 210/638 5,174,901 A 12/1992 Smith 210/652 5,246,586 A 9/1993 Ban et al. 210/638 5,246,589 A * 9/1993 Ban et al. 210/638 5,250,185 A 10/1993 Tao et al. 210/638 5,292,439 A 3/1994 Morita et al. 210/638 5,338,456 A 8/1994 Stivers 210/638 5,352,345 A * 10/1994 Byszewski et al. 210/639 5,385,640 A 10/1994 Zeiher et al. 210/639 5,376,660 A 11/1995 Green 210/638 5,571,419 A 11/1996 Obata et al. 210/638 5,573,662 A 11/1996 Korin 210/232 5,573,663 A 9/1997 Collentro et al. 210/655 5,645,727 A 7/1997 Bhave et al. | | | | | |
| 4,969,520 A 11/1990 Jan et al. 166/266 4,995,983 A 2/1991 Eadie et al. 210/639 5,028,336 A 7/1991 Bartels et al. 210/639 5,061,374 A 10/1991 Lewis 210/638 5,073,268 A * 12/1991 Saito et al. 210/638 5,174,901 A 12/1992 Smith 210/652 5,236,722 A 8/1993 Schroeder 426/67 5,246,586 A 9/1993 Ban et al. 210/638 5,246,589 A * 9/1993 Ban et al. 210/654 5,266,203 A * 11/1993 Mukhopadhyay et al. 210/638 5,292,439 A 3/1994 Morita et al. 210/638 5,352,345 A * 10/1994 Byszewski et al. 210/632 5,358,640 A 10/1994 Zeiher et al. 210/639 5,385,664 A 11/1995 Green 210/638 5,529,689 A 6/1996 Korin 210/232 5,571,419 A 11/1996 Obata et al. 210/638 5,573,662 A 11/1996 Abe 210/188 5,573,663 A 9/1997 Collentro et al. 210/651 5,6645,727 A 7/1997 Bhave et al. <td></td> <td>Α</td> <td></td> <td>4/1990</td> <td></td> | | Α | | 4/1990 | |
| 4,995,983 A 2/1991 Eadie et al. 210/639 5,028,336 A 7/1991 Bartels et al. 210/639 5,061,374 A 10/1991 Lewis 210/638 5,073,268 A * 12/1991 Saito et al. 210/638 5,174,901 A 12/1992 Smith 210/652 5,236,722 A 8/1993 Schroeder 426/67 5,246,588 A 9/1993 Ban et al. 210/638 5,246,589 A * 9/1993 Ban et al. 210/638 5,250,185 A 10/1993 Tao et al. 210/654 5,266,203 A * 11/1993 Mukhopadhyay et al. 210/638 5,338,456 A 8/1994 Stivers 210/638 5,352,345 A * 10/1994 Byszewski et al. 210/639 5,385,640 A 10/1994 Seiher et al. 210/639 5,573,664 A 12/1995 Green 210/638 5,529,689 A 6/1996 Korin 210/232 5,573,666 A 11/1996 Obata et al. 210/638 5,573,666 A 11/1996 Korin 210/232 5,670,053 A * 9/1997 Collentro et al. 210/651 5,695,643 A 12/1997 Brandt et al. | | Α | | | |
| 5,028,336 A 7/1991 Bartels et al. 210/639 5,061,374 A 10/1991 Lewis 210/638 5,073,268 A * 12/1991 Saito et al. 210/638 5,174,901 A 12/1992 Smith 210/652 5,236,722 A 8/1993 Schroeder 426/67 5,246,586 A 9/1993 Ban et al. 210/638 5,246,589 A * 9/1993 Ban et al. 210/638 5,250,185 A 10/1993 Tao et al. 210/638 5,292,439 A 3/1994 Morita et al. 210/638 5,338,456 A 8/1994 Stivers 210/652 5,358,640 A 10/1994 Byszewski et al. 5,358,664 A 10/1994 Zeiher et al. 210/639 5,358,660 A 1/1995 Green 210/638 5,529,689 A 6/1996 Korin 210/232 5,571,419 A 11/1996 Obata et al. 210/638 5,573,666 A 11/1996 Korin 210/232 5,670,053 A * 9/1997 Collentro et al. 210/651 5,695,643 A 12/1997 Brandt et al. 210/652 5,766,479 A * 6/1998 Klamizov et al. 210/652 </td <td></td> <td></td> <td></td> <td>2/1991</td> <td></td> | | | | 2/1991 | |
| 5,061,374 A 10/1991 Lewis 210/638 5,073,268 A * 12/1991 Saito et al. 210/638 5,174,901 A 12/1992 Smith 210/652 5,236,722 A 8/1993 Schroeder 426/67 5,246,586 A 9/1993 Ban et al. 210/638 5,246,589 A * 9/1993 Ban et al. 210/638 5,250,185 A 10/1993 Tao et al. 210/638 5,266,203 A * 11/1993 Mukhopadhyay et al. 210/638 5,338,456 A 8/1994 Stivers 210/638 5,352,345 A * 10/1994 Byszewski et al. 210/652 5,358,640 A 10/1994 Zeiher et al. 210/639 5,385,664 A 1/1995 Oinuma et al. 210/151 5,476,591 A 12/1995 Green 210/638 5,573,662 A 11/1996 Korin 210/232 5,573,662 A 11/1996 Obata et al. 210/664 5,573,666 A 11/1996 Korin 210/232 5,670,053 A * 9/1997 Collentro et al. 210/651 5,695,643 A 12/1997 Brandt et al. 210/652 5,766,479 A * 6/1998 Collentro et al | | Α | | 7/1991 | |
| 5,073,268 A * 12/1991 Saito et al. 210/638 5,174,901 A 12/1992 Smith 210/652 5,236,722 A 8/1993 Schroeder 426/67 5,246,586 A 9/1993 Ban et al. 210/638 5,246,589 A * 9/1993 Ban et al. 210/638 5,250,185 A 10/1993 Tao et al. 210/638 5,266,203 A * 11/1993 Mukhopadhyay et al. 210/638 5,338,456 A 8/1994 Stivers 210/652 5,352,345 A * 10/1994 Byszewski et al. 5,385,664 A 10/1994 Green 210/639 5,476,591 A 12/1995 Green 210/638 5,579,689 A 6/1996 Korin 210/232 5,571,419 A 11/1996 Obata et al. 210/232 5,645,727 A 7/1997 Bhave et al. 210/651 5,695,643 A 12/1997 Brandt et al. 210/651 5,695,643 A 12/1997 Brandt et al. 210/652 5,786,479 A * 9/1998 Klamizov et al. 210/652 | | | | | |
| 5,236,722 A 8/1993 Schroeder 426/67 5,246,586 A 9/1993 Ban et al. 210/638 5,246,589 A 9/1993 Ban et al. 210/654 5,250,185 A 10/1993 Tao et al. 210/654 5,266,203 A 11/1993 Mukhopadhyay et al. 210/638 5,292,439 A 3/1994 Morita et al. 210/638 5,338,456 A 8/1994 Stivers 210/652 5,352,345 A 10/1994 Byszewski et al. 210/639 5,358,640 A 10/1994 Zeiher et al. 210/639 5,385,664 A 1/1995 Oinuma et al. 210/638 5,529,689 A 6/1996 Korin 210/232 5,571,419 A 11/1996 Obata et al. 210/664 5,573,662 A 11/1996 Abe 210/188 5,573,663 A 11/1996 Korin 210/232 5,645,727 A 7/1997 Bhave et al. 210/651 5,695,643 A 12/1997 Brandt et al. 210/652 5,766,479 A * 6/1998 Collentro et al. 210/639 5,814,224 A * 9/1998 Klamizov et al. 5,925,255 A * 7/1999 Mukhopadhay 210/6 | | Α | * | 12/1991 | Saito et al |
| 5,236,722 A 8/1993 Schroeder 426/67 5,246,586 A 9/1993 Ban et al. 210/638 5,246,589 A 9/1993 Ban et al. 210/654 5,250,185 A 10/1993 Tao et al. 210/654 5,266,203 A 11/1993 Mukhopadhyay et al. 210/638 5,292,439 A 3/1994 Morita et al. 210/638 5,338,456 A 8/1994 Stivers 210/652 5,352,345 A 10/1994 Byszewski et al. 210/639 5,358,640 A 10/1994 Zeiher et al. 210/639 5,385,664 A 1/1995 Oinuma et al. 210/638 5,529,689 A 6/1996 Korin 210/232 5,571,419 A 11/1996 Obata et al. 210/664 5,573,662 A 11/1996 Abe 210/188 5,573,663 A 19/1997 Bhave et al. 210/232 5,645,727 A 7/1997 Bhave et al. 210/651 5,695,643 A 12/1997 Brandt et al. 210/652 5,766,479 A * 6/1998 Collentro et al. 210/639 5,814,224 A * 9/1998 Klamizov et al. 5,925,255 A * 7/1999 Mukhopadhay <t< td=""><td>5,174,901</td><td>Α</td><td></td><td>12/1992</td><td>Smith 210/652</td></t<> | 5,174,901 | Α | | 12/1992 | Smith 210/652 |
| 5,246,589 A * 9/1993 Ban et al. 5,250,185 A 10/1993 Tao et al. 210/654 5,266,203 A * 11/1993 Mukhopadhyay et al. 210/638 5,292,439 A 3/1994 Morita et al. 210/638 5,338,456 A 8/1994 Stivers 210/652 5,352,345 A * 10/1994 Byszewski et al. 210/639 5,358,660 A 10/1994 Zeiher et al. 210/639 5,476,591 A 12/1995 Green 210/638 5,529,689 A 6/1996 Korin 210/232 5,571,419 A 11/1996 Obata et al. 210/664 5,573,662 A 11/1996 Abe 210/188 5,573,663 A * 9/1997 Collentro et al. 210/651 5,695,643 A 12/1997 Brandt et al. 210/651 5,695,643 A 12/1997 Brandt et al. 210/652 5,766,479 A * 6/1998 Collentro et al. 210/639 5,814,224 A * 9/1998 Klamizov et al. 5,925,255 A * 7/1999 Mukhopadhay 210/652 | | A | | | Schroeder 426/67 |
| 5,246,589 A * 9/1993 Ban et al. 5,250,185 A 10/1993 Tao et al. 210/654 5,266,203 A * 11/1993 Mukhopadhyay et al. 210/638 5,292,439 A 3/1994 Morita et al. 210/638 5,338,456 A 8/1994 Stivers 210/652 5,352,345 A * 10/1994 Byszewski et al. 210/639 5,358,664 A 10/1994 Zeiher et al. 210/639 5,476,591 A 12/1995 Green 210/638 5,529,689 A 6/1996 Korin 210/232 5,571,419 A 11/1996 Obata et al. 210/664 5,573,662 A 11/1996 Abe 210/188 5,573,663 A 11/1996 Korin 210/232 5,645,727 A 7/1997 Bhave et al. 210/651 5,695,643 A 12/1997 Brandt et al. 210/652 5,766,479 A * 6/1998 Collentro et al. 210/639 5,814,224 A * 9/1998 Klamizov et al. 5,925,255 A * 7/1999 Mukhopadhay 210/652 | | Α | | 9/1993 | Ban et al 210/638 |
| 5,266,203 A * 11/1993 Mukhopadhyay et al. 210/638 5,292,439 A 3/1994 Morita et al. 210/638 5,338,456 A 8/1994 Stivers 210/652 5,352,345 A * 10/1994 Byszewski et al. 210/639 5,358,640 A 10/1994 Zeiher et al. 210/53 5,358,660 A 1/1995 Green et al. 210/638 5,476,591 A 12/1995 Green et al. 210/638 5,529,689 A 6/1996 Korin 210/232 210/664 5,573,662 A 11/1996 Obata et al. 210/664 5,573,666 A 11/1996 Korin 210/232 5,645,727 A 7/1997 Bhave et al. 210/651 5,695,643 A 12/1997 Brandt et al. 210/652 5,766,479 A * 9/1998 Collentro et al. 210/639 5,814,224 A * 9/1998 Klamizov et al. | | A | * | 9/1993 | |
| 5,292,439 A 3/1994 Morita et al. 210/638 5,338,456 A 8/1994 Stivers 210/652 5,352,345 A * 10/1994 Byszewski et al. 210/639 5,358,640 A 10/1994 Zeiher et al. 210/639 5,385,664 A 1/1995 Oinuma et al. 210/151 5,476,591 A 12/1995 Green 210/638 5,529,689 A 6/1996 Korin 210/232 5,571,419 A 11/1996 Obata et al. 210/664 5,573,662 A 11/1996 Abe 210/188 5,573,666 A 11/1996 Korin 210/232 5,645,727 A 7/1997 Bhave et al. 210/651 5,695,643 A 12/1997 Brandt et al. 210/652 5,766,479 A * 6/1998 Collentro et al. 210/639 5,814,224 A * 9/1998 Klamizov et al. 5,925,255 A * 7/1999 Mukhopadhay 210/652 | | Α | | 10/1993 | Tao et al 210/654 |
| 5,292,439 A 3/1994 Morita et al. 210/638 5,338,456 A 8/1994 Stivers 210/652 5,352,345 A * 10/1994 Byszewski et al. 210/639 5,358,640 A 10/1994 Zeiher et al. 210/639 5,385,664 A 1/1995 Green 210/638 5,576,591 A 12/1995 Green 210/638 5,529,689 A 6/1996 Korin 210/232 5,571,419 A 11/1996 Obata et al. 210/664 5,573,662 A 11/1996 Abe 210/188 5,573,666 A 11/1996 Korin 210/232 5,645,727 A 7/1997 Bhave et al. 210/651 5,695,643 A 12/1997 Brandt et al. 210/652 5,766,479 A * 6/1998 Collentro et al. 210/639 5,814,224 A * 9/1998 Klamizov et al. 5,925,255 A * 7/1999 Mukhopadhay 210/652 | 5,266,203 | Α | * | 11/1993 | Mukhopadhyay et al 210/638 |
| 5,352,345 A * 10/1994 Byszewski et al. 5,358,640 A 10/1994 Zeiher et al. 210/639 5,385,664 A 1/1995 Oinuma et al. 210/151 5,476,591 A 12/1995 Green 210/638 5,529,689 A 6/1996 Korin 210/232 5,571,419 A 11/1996 Obata et al. 210/664 5,573,662 A 11/1996 Korin 210/232 5,645,727 A 7/1997 Bhave et al. 210/651 5,695,643 A 12/1997 Brandt et al. 210/652 5,766,479 A * 6/1998 Collentro et al. 210/639 5,814,224 A * 9/1998 Klamizov et al. 5,925,255 A * 7/1999 Mukhopadhay 210/652 | 5,292,439 | Α | | 3/1994 | |
| 5,358,640 A 10/1994 Zeiher et al. 210/639 5,385,664 A 1/1995 Oinuma et al. 210/151 5,476,591 A 12/1995 Green 210/638 5,529,689 A 6/1996 Korin 210/232 5,571,419 A 11/1996 Obata et al. 210/664 5,573,662 A 11/1996 Abe 210/188 5,573,666 A 11/1996 Korin 210/232 5,645,727 A 7/1997 Bhave et al. 210/651 5,695,643 A 12/1997 Brandt et al. 210/652 5,766,479 A * 6/1998 Collentro et al. 210/639 5,814,224 A * 9/1998 Klamizov et al. 5,925,255 A * 7/1999 Mukhopadhay 210/652 | 5,338,456 | Α | | 8/1994 | Stivers 210/652 |
| 5,385,664 A 1/1995 Oinuma et al. 210/151 5,476,591 A 12/1995 Green 210/638 5,529,689 A 6/1996 Korin 210/232 5,571,419 A 11/1996 Obata et al. 210/664 5,573,662 A 11/1996 Abe 210/188 5,573,666 A 11/1996 Korin 210/232 5,645,727 A 7/1997 Bhave et al. 210/651 5,695,643 A 12/1997 Collentro et al. 210/652 5,766,479 A 6/1998 Collentro et al. 210/639 5,814,224 A 9/1998 Klamizov et al. 5,925,255 A 7/1999 Mukhopadhay 210/652 | 5,352,345 | A | * | 10/1994 | Byszewski et al. |
| 5,476,591 A 12/1995 Green 210/638 5,529,689 A 6/1996 Korin 210/232 5,571,419 A 11/1996 Obata et al. 210/664 5,573,662 A 11/1996 Abe 210/188 5,573,666 A 11/1996 Korin 210/232 5,645,727 A 7/1997 Bhave et al. 210/651 5,695,643 A 12/1997 Brandt et al. 210/652 5,766,479 A 6/1998 Collentro et al. 210/639 5,814,224 A 9/1998 Klamizov et al. 5,925,255 A 7/1999 Mukhopadhay 210/652 | 5,358,640 | Α | | 10/1994 | Zeiher et al 210/639 |
| 5,529,689 A 6/1996 Korin 210/232 5,571,419 A 11/1996 Obata et al. 210/664 5,573,662 A 11/1996 Abe 210/188 5,573,666 A 11/1996 Korin 210/232 5,645,727 A 7/1997 Bhave et al. 210/651 5,695,643 A 12/1997 Collentro et al. 210/652 5,766,479 A 6/1998 Collentro et al. 210/639 5,814,224 A * 9/1998 Klamizov et al. 5,925,255 A * 7/1999 Mukhopadhay 210/652 | 5,385,664 | Α | | 1/1995 | Oinuma et al 210/151 |
| 5,571,419 A 11/1996 Obata et al. 210/664 5,573,662 A 11/1996 Abe 210/188 5,573,666 A 11/1996 Korin 210/232 5,645,727 A 7/1997 Bhave et al. 210/651 5,695,643 A 12/1997 Collentro et al. 210/652 5,766,479 A 6/1998 Collentro et al. 210/639 5,814,224 A 9/1998 Klamizov et al. 5,925,255 A 7/1999 Mukhopadhay 210/652 | 5,476,591 | Α | | 12/1995 | Green 210/638 |
| 5,573,662 A 11/1996 Abe 210/188 5,573,666 A 11/1996 Korin 210/232 5,645,727 A 7/1997 Bhave et al. 210/651 5,670,053 A 9/1997 Collentro et al. 210/655 5,695,643 A 12/1997 Brandt et al. 210/652 5,766,479 A 6/1998 Collentro et al. 210/639 5,814,224 A 9/1998 Klamizov et al. 5,925,255 A 7/1999 Mukhopadhay 210/652 | 5,529,689 | Α | | 6/1996 | Korin 210/232 |
| 5,573,666 A 11/1996 Korin 210/232 5,645,727 A 7/1997 Bhave et al. 210/651 5,670,053 A 9/1997 Collentro et al. 210/651 5,695,643 A 12/1997 Brandt et al. 210/652 5,766,479 A 6/1998 Collentro et al. 210/639 5,814,224 A 9/1998 Klamizov et al. 5,925,255 A 7/1999 Mukhopadhay 210/652 | 5,571,419 | Α | | 11/1996 | Obata et al 210/664 |
| 5,645,727 A 7/1997 Bhave et al. 210/651 5,670,053 A 9/1997 Collentro et al. 210/651 5,695,643 A 12/1997 Brandt et al. 210/652 5,766,479 A 6/1998 Collentro et al. 210/639 5,814,224 A 9/1998 Klamizov et al. 5,925,255 A 7/1999 Mukhopadhay 210/652 | 5,573,662 | A | | 11/1996 | Abe 210/188 |
| 5,670,053 A * 9/1997 Collentro et al. 210/651 5,695,643 A 12/1997 Brandt et al. 210/652 5,766,479 A * 6/1998 Collentro et al. 210/639 5,814,224 A * 9/1998 Klamizov et al. 5,925,255 A * 7/1999 Mukhopadhay 210/652 | 5,573,666 | A | | 11/1996 | Korin 210/232 |
| 5,695,643 A 12/1997 Brandt et al. 210/652 5,766,479 A 6/1998 Collentro et al. 210/639 5,814,224 A 9/1998 Klamizov et al. 5,925,255 A 7/1999 Mukhopadhay 210/652 | 5,645,727 | A | | 7/1997 | Bhave et al 210/651 |
| 5,766,479 A * 6/1998 Collentro et al | 5,670,053 | A | * | 9/1997 | |
| 5,814,224 A * 9/1998 Klamizov et al. 5,925,255 A * 7/1999 Mukhopadhay | | A | | 12/1997 | |
| 5,925,255 A * 7/1999 Mukhopadhay | 5,766,479 | A | * | 6/1998 | Collentro et al 210/639 |
| | 5,814,224 | A | * | 9/1998 | Klamizov et al. |
| 6,267,891 B1 7/2001 Tonelli et al. | | A | * | 7/1999 | Mukhopadhay 210/652 |
| | 6,267,891 | B 1 | | 7/2001 | Tonelli et al. |

FOREIGN PATENT DOCUMENTS

| DE | 2607737 A2 9/1976 |
|----|----------------------|
| DE | 19603494 C2 2/1998 |
| JP | 50-75987 A2 6/1975 |
| JP | 55-012284 B1 4/1980 |
| JP | 59-112890 A2 6/1984 |
| JP | 62-204892 A2 9/1987 |
| JP | 62-294484 A2 12/1987 |
| JP | 2-207888 * 8/1990 |
| JP | 02-227185 A2 9/1990 |
| JP | 05-012040 B2 2/1993 |
| JP | 05-269463 A2 10/1993 |
| JP | 06-049191 B2 6/1994 |
| JP | 08-029315 B2 3/1996 |

OTHER PUBLICATIONS

DE-1792304-B (Aug. 1975)—Derwent Abstract to issued patent.

DE-2607737-A1 (Sep. 1976)—Derwent Abstract to unexamined patent application.

JP-53-004777-A2 (Jan. 1978)—KOKAI Abstract (Patolis). JP-54-069579-A2—(Jun. 1979) -KOKAI Abstract (Patolis).

JP-54-083688-A2 (Jul. 1979)—KOKAI Abstract (Patolis).
JP-56-139106-A2 (Oct. 1981)—KOKAI Abstract (Patolis).

JP-58-118538-A2 (Jul. 1983)—Dialog Abstract of KOKAI.

JP-58-122084-A2 (Jul. 1983)—KOKAI Abstract (Patolis). JP-59-112890-A2 (Jun. 1984)—Patent Abstracts of Japan, vol. 008, No. 232 (C-248) Oct. 25, 1984.

JP-59-112890-A2 (Jun. 1984)—Abstract—Figures—Tables, Derwent Publications Ltd., London, GB, AN 1984-19809, XP002147898.

JP-59-112890-A2 (Jun. 1984)—Chemical Abstracts, vol. 101, No. 22, Nov. 26, 1984, Columbus, Ohio, US, Abstract No. 19754, XP002147895.

JP-62-110795-A2 (Jun. 1987)—Patent Abstracts of Japan, Published: May 21, 1987.

JP-62-110795-A2 (May 1987)—Delphion Abstract; Publication Date: May 21, 1987.

JP-62-294484-A2 (Dec. 1987)—Patent Abstracts of Japan, vol. 012, No. 19, (C-501) Jun. 3, 1988.

JP-62-294484-A2 (Dec. 1987)—Patent Abstracts of Japan (Application No. 61138486).

JP-62-294484-A2 (Dec. 1987)—Delphion Abstract; Publication Date: Dec. 21, 1987.

JP-62-294484-A2 (Dec. 1987)—Abstract—Tables, Derwent Publications Ltd., London GB, AN 1988-033867, XP002147896.

JP-62-294484-A2 (Dec. 1987)—Chemical Abstracts, vol. 108, No. 20, May 16, 1988, Columbus, Ohio, U.S., Abstract No. 173328, XP002147894.

JP-63-028486-A2 (Feb. 1988)—Application No. 6117235—Patent Abstracts of Japan, Published: Feb. 6, 1988

JP-63-028486-A2 (Feb. 1988)—Delphion Abstract Publication Date: Feb. 6, 1988.

JP-02-052088-A2 (Feb. 1990)—Patent Abstracts of Japan; Publication Date: Feb. 21, 1990.

JP-02-052088-A2 (Feb. 1990)—Patent Abstracts of Japan. JP-02-052088-A2 (Feb. 1990)—Patent Abstracts of Japan; Delphion Abstract, Publication Date: Feb. 21, 1990.

JP-02-227185-A2 (Sep. 1990)—Patent Abstracts of Japan; Publication Date: Sep. 10, 1990.

JP-02-227185-A2 (Sep. 1990)—DialogIP Document Abstract.

JP-02-227185-A2 (Sep. 1990)—Delphion Abstract; Publication Date: Sep. 10, 1990.

JP-02-227185-A2 (Sep. 1990)—Issued Sep. 10, 1990—Derwent Abstract.

JP-04-118004-A2 (Apr. 1992)—Patent Abstract of Japan, Apr. 20, 1992, Application No. 02235899.

JP-05-012040-B2 (Feb. 1993)—Issued: Feb. 17, 1993 (INPADOC Abstract Record).

JP-05-269463-A2 (Oct. 1993)—Patent Abstracts of Japan, vol. 018, No. 043, (C-1156) Jan. 24, 1994.

JP-05-269463-A2 (Oct. 1993)—Abstract—Derwent Publications Ltd., London GB, AN 1993-364476, XP002147897.