



US00D964564S

(12) **United States Design Patent** (10) **Patent No.:** **US D964,564 S**  
**Boudreaux** (45) **Date of Patent:** **\*\* Sep. 20, 2022**

(54) **SURGICAL STAPLE CARTRIDGE RETAINER  
WITH A CLOSURE SYSTEM  
AUTHENTICATION KEY**

FOREIGN PATENT DOCUMENTS

AU 2015201140 A1 3/2015  
CA 2795323 A1 5/2014

(Continued)

(71) Applicant: **Cilag GmbH International**, Zug (CH)

(72) Inventor: **Chad P. Boudreaux**, Cincinnati, OH  
(US)

OTHER PUBLICATIONS

US 10,504,709 B2, 12/2019, Karancsi et al. (withdrawn)  
(Continued)

(73) Assignee: **Cilag GmbH International**, Zug (CH)

(\*\*) Term: **15 Years**

*Primary Examiner* — Wan Laymon

(21) Appl. No.: **29/696,067**

(57) **CLAIM**

(22) Filed: **Jun. 25, 2019**

The ornamental design for a surgical staple cartridge retainer with a closure system authentication key, as shown and described.

(51) **LOC (13) Cl.** ..... **24-02**

(52) **U.S. Cl.**  
USPC ..... **D24/145**

(58) **Field of Classification Search**

USPC ..... D24/145, 127, 133  
CPC ..... A61B 17/07207; A61B 17/072; A61B 17/064; A61B 17/068; A61B 2017/07214; A61B 2017/07221; A61B 2017/07228; A61B 2017/07271

See application file for complete search history.

**DESCRIPTION**

FIG. 1 is a front perspective view of a surgical staple cartridge retainer with a closure system authentication key according to our new design;

FIG. 2 is a right side elevational view of the surgical staple cartridge retainer;

FIG. 3 is a left side elevational view of the surgical staple cartridge retainer;

FIG. 4 is a top view of the surgical staple cartridge retainer;

FIG. 5 is a bottom view of the surgical staple cartridge retainer;

FIG. 6 is an enlarged front elevational view of the surgical staple cartridge retainer; and,

FIG. 7 is an enlarged rear elevational view of the surgical staple cartridge retainer.

The broken lines immediately adjacent the shaded areas represent the bounds of the claimed design while all other broken lines are directed to environment and are for illustrative purposes only; the broken lines form no part of the claimed design.

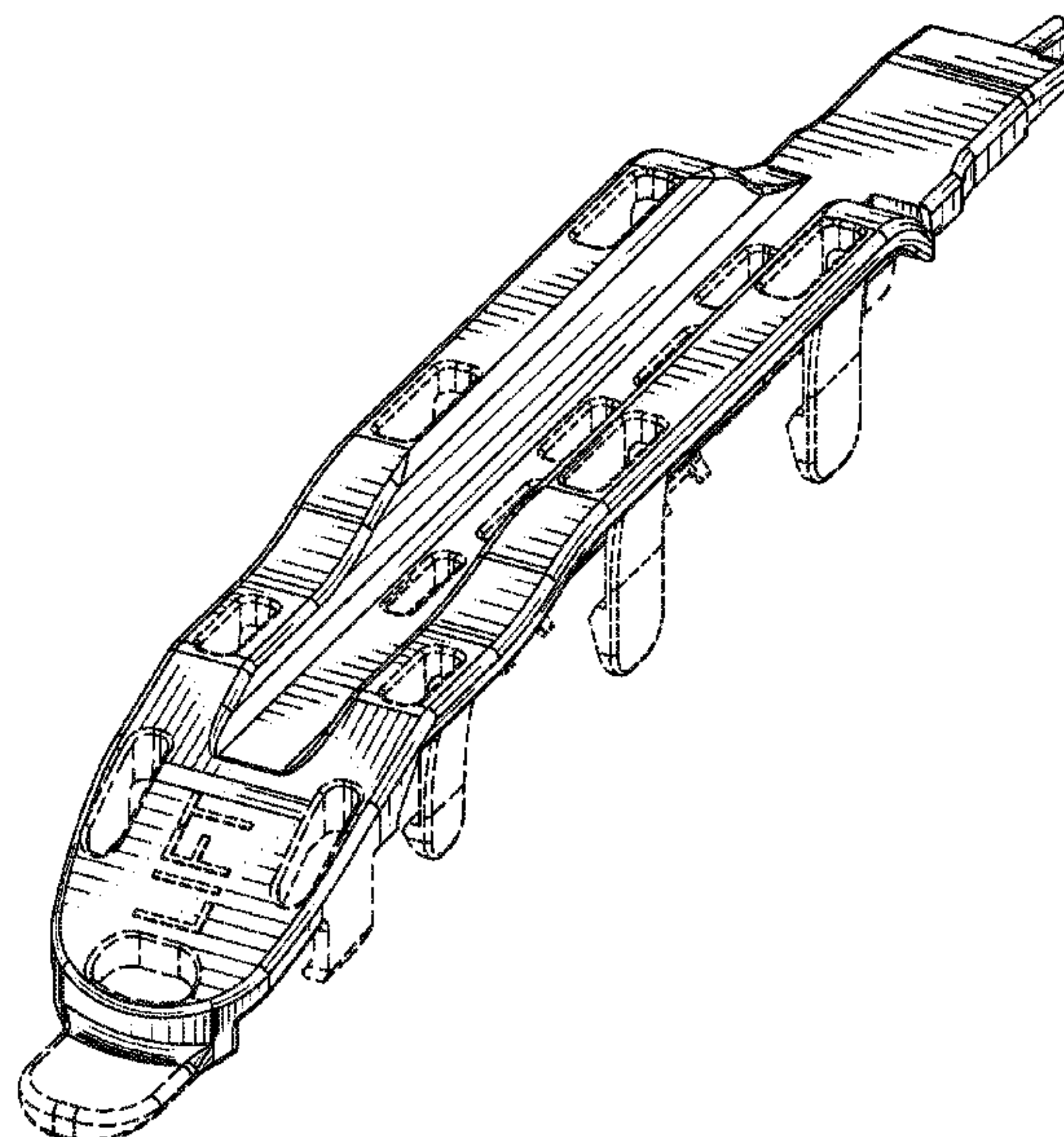
(56) **References Cited**

U.S. PATENT DOCUMENTS

|             |         |               |
|-------------|---------|---------------|
| 1,853,416 A | 4/1932  | Hall          |
| 2,222,125 A | 11/1940 | Stehlik       |
| 3,082,426 A | 3/1963  | Miles         |
| 3,503,396 A | 3/1970  | Pierie et al. |
| 3,584,628 A | 6/1971  | Green         |
| 3,626,457 A | 12/1971 | Duerr et al.  |
| 3,633,584 A | 1/1972  | Farrell       |
| 3,759,017 A | 9/1973  | Young         |
| 3,863,118 A | 1/1975  | Lander et al. |
| 3,898,545 A | 8/1975  | Coppa et al.  |
| 3,912,121 A | 10/1975 | Steffen       |
| 3,915,271 A | 10/1975 | Harper        |

(Continued)

**1 Claim, 5 Drawing Sheets**





(56)

## References Cited

## U.S. PATENT DOCUMENTS

|             |         |                   |              |         |                       |
|-------------|---------|-------------------|--------------|---------|-----------------------|
| 3,932,812 A | 1/1976  | Milligan          | 5,626,587 A  | 5/1997  | Bishop et al.         |
| 4,041,362 A | 8/1977  | Ichiyonagi        | 5,643,291 A  | 7/1997  | Pier et al.           |
| 4,052,649 A | 10/1977 | Greenwell et al.  | 5,654,750 A  | 8/1997  | Weil et al.           |
| 4,087,730 A | 5/1978  | Goles             | 5,673,841 A  | 10/1997 | Schulze et al.        |
| 4,157,859 A | 6/1979  | Terry             | 5,673,842 A  | 10/1997 | Bittner et al.        |
| 4,171,700 A | 10/1979 | Farin             | 5,675,227 A  | 10/1997 | Roos et al.           |
| 4,202,722 A | 5/1980  | Paquin            | 5,693,042 A  | 12/1997 | Boiarski et al.       |
| 4,412,539 A | 11/1983 | Jarvik            | 5,693,052 A  | 12/1997 | Weaver                |
| 4,448,193 A | 5/1984  | Ivanov            | 5,695,502 A  | 12/1997 | Pier et al.           |
| 4,523,695 A | 6/1985  | Braun et al.      | 5,697,926 A  | 12/1997 | Weaver                |
| 4,608,160 A | 8/1986  | Zoch              | 5,706,998 A  | 1/1998  | Plyley et al.         |
| 4,614,366 A | 9/1986  | North et al.      | 5,718,359 A  | 2/1998  | Palmer et al.         |
| 4,633,874 A | 1/1987  | Chow et al.       | 5,724,468 A  | 3/1998  | Leone et al.          |
| 4,701,193 A | 10/1987 | Robertson et al.  | 5,725,536 A  | 3/1998  | Oberlin et al.        |
| 4,735,603 A | 4/1988  | Goodson et al.    | 5,725,542 A  | 3/1998  | Yoon                  |
| 4,788,977 A | 12/1988 | Farin et al.      | 5,735,445 A  | 4/1998  | Vidal et al.          |
| 4,849,752 A | 7/1989  | Bryant            | 5,735,848 A  | 4/1998  | Yates et al.          |
| D303,787 S  | 10/1989 | Messenger et al.  | 5,746,209 A  | 5/1998  | Yost et al.           |
| 4,892,244 A | 1/1990  | Fox et al.        | 5,749,362 A  | 5/1998  | Funda et al.          |
| 4,976,173 A | 12/1990 | Yang              | 5,749,893 A  | 5/1998  | Vidal et al.          |
| 5,010,341 A | 4/1991  | Huntley et al.    | 5,752,644 A  | 5/1998  | Bolanos et al.        |
| 5,026,387 A | 6/1991  | Thomas            | 5,762,255 A  | 6/1998  | Chrisman et al.       |
| 5,035,692 A | 7/1991  | Lyon et al.       | 5,766,186 A  | 6/1998  | Faraz et al.          |
| 5,042,460 A | 8/1991  | Sakurai et al.    | 5,769,791 A  | 6/1998  | Benaron et al.        |
| 5,047,043 A | 9/1991  | Kubota et al.     | 5,775,331 A  | 7/1998  | Raymond et al.        |
| 5,084,057 A | 1/1992  | Green et al.      | 5,797,537 A  | 8/1998  | Oberlin et al.        |
| 5,100,402 A | 3/1992  | Fan               | 5,800,350 A  | 9/1998  | Coppleson et al.      |
| D327,061 S  | 6/1992  | Soren et al.      | D399,561 S   | 10/1998 | Ellingson             |
| 5,129,570 A | 7/1992  | Schulze et al.    | 5,817,093 A  | 10/1998 | Williamson, IV et al. |
| 5,151,102 A | 9/1992  | Kamiyama et al.   | 5,820,009 A  | 10/1998 | Melling et al.        |
| 5,156,315 A | 10/1992 | Green et al.      | 5,833,690 A  | 11/1998 | Yates et al.          |
| 5,158,585 A | 10/1992 | Saho et al.       | 5,836,849 A  | 11/1998 | Mathiak et al.        |
| 5,171,247 A | 12/1992 | Hughett et al.    | 5,836,869 A  | 11/1998 | Kudo et al.           |
| 5,189,277 A | 2/1993  | Boisvert et al.   | 5,836,909 A  | 11/1998 | Cosmescu              |
| 5,197,962 A | 3/1993  | Sansom et al.     | 5,843,080 A  | 12/1998 | Fleenor et al.        |
| 5,204,669 A | 4/1993  | Dorfe et al.      | 5,846,237 A  | 12/1998 | Nettekoven            |
| 5,242,474 A | 9/1993  | Herbst et al.     | 5,849,022 A  | 12/1998 | Sakashita et al.      |
| 5,253,793 A | 10/1993 | Green et al.      | 5,873,873 A  | 2/1999  | Smith et al.          |
| 5,271,543 A | 12/1993 | Grant et al.      | 5,878,938 A  | 3/1999  | Bittner et al.        |
| RE34,519 E  | 1/1994  | Fox et al.        | 5,893,849 A  | 4/1999  | Weaver                |
| 5,275,323 A | 1/1994  | Schulze et al.    | 5,906,625 A  | 5/1999  | Bito et al.           |
| 5,318,516 A | 6/1994  | Cosmescu          | 5,942,333 A  | 8/1999  | Arnett et al.         |
| 5,318,563 A | 6/1994  | Malis et al.      | 5,947,996 A  | 9/1999  | Logeman               |
| 5,322,055 A | 6/1994  | Davison et al.    | 5,968,032 A  | 10/1999 | Sleister              |
| 5,342,349 A | 8/1994  | Kaufman           | 5,980,510 A  | 11/1999 | Tsonton et al.        |
| 5,364,003 A | 11/1994 | Williamson, IV    | 5,987,346 A  | 11/1999 | Benaron et al.        |
| 5,383,880 A | 1/1995  | Hooven            | 5,997,528 A  | 12/1999 | Bisch et al.          |
| 5,396,900 A | 3/1995  | Slater et al.     | 6,010,054 A  | 1/2000  | Johnson et al.        |
| 5,397,046 A | 3/1995  | Savage et al.     | 6,030,437 A  | 2/2000  | Gourrier et al.       |
| 5,403,312 A | 4/1995  | Yates et al.      | 6,036,637 A  | 3/2000  | Kudo                  |
| 5,403,327 A | 4/1995  | Thornton et al.   | 6,039,734 A  | 3/2000  | Goble                 |
| 5,413,267 A | 5/1995  | Solyntjes et al.  | 6,039,735 A  | 3/2000  | Greep                 |
| 5,415,335 A | 5/1995  | Knodel, Jr.       | 6,059,799 A  | 5/2000  | Aranyi et al.         |
| 5,417,699 A | 5/1995  | Klein et al.      | 6,066,137 A  | 5/2000  | Greep                 |
| 5,439,468 A | 8/1995  | Schulze et al.    | 6,079,606 A  | 6/2000  | Milliman et al.       |
| 5,445,304 A | 8/1995  | Plyley et al.     | 6,090,107 A  | 7/2000  | Borgmeier et al.      |
| 5,462,545 A | 10/1995 | Wang et al.       | 6,099,537 A  | 8/2000  | Sugai et al.          |
| 5,465,895 A | 11/1995 | Knodel et al.     | 6,102,907 A  | 8/2000  | Smethers et al.       |
| 5,467,911 A | 11/1995 | Tsuruta et al.    | 6,109,500 A  | 8/2000  | Alli et al.           |
| 5,474,566 A | 12/1995 | Alesi et al.      | 6,113,598 A  | 9/2000  | Baker                 |
| 5,485,947 A | 1/1996  | Olson et al.      | 6,126,592 A  | 10/2000 | Proch et al.          |
| 5,496,315 A | 3/1996  | Weaver et al.     | 6,126,658 A  | 10/2000 | Baker                 |
| 5,496,317 A | 3/1996  | Goble et al.      | 6,131,789 A  | 10/2000 | Schulze et al.        |
| 5,503,320 A | 4/1996  | Webster et al.    | 6,155,473 A  | 12/2000 | Tompkins et al.       |
| 5,529,235 A | 6/1996  | Boiarski et al.   | 6,214,000 B1 | 4/2001  | Fleenor et al.        |
| 5,531,743 A | 7/1996  | Nettekoven et al. | 6,258,105 B1 | 7/2001  | Hart et al.           |
| 5,545,148 A | 8/1996  | Wurster           | 6,269,411 B1 | 7/2001  | Reasoner              |
| 5,552,685 A | 9/1996  | Young et al.      | 6,273,887 B1 | 8/2001  | Yamauchi et al.       |
| 5,560,372 A | 10/1996 | Cory              | 6,301,495 B1 | 10/2001 | Guezic et al.         |
| 5,584,425 A | 12/1996 | Savage et al.     | 6,302,881 B1 | 10/2001 | Farin                 |
| 5,610,379 A | 3/1997  | Muz et al.        | 6,308,089 B1 | 10/2001 | von der Ruhr et al.   |
| 5,610,811 A | 3/1997  | Honda             | 6,325,808 B1 | 12/2001 | Bernard et al.        |
| 5,613,966 A | 3/1997  | Makower et al.    | 6,325,811 B1 | 12/2001 | Messerly              |
| 5,624,452 A | 4/1997  | Yates             | 6,331,181 B1 | 12/2001 | Tierney et al.        |
| D379,346 S  | 5/1997  | Mieki             | 6,341,164 B1 | 1/2002  | Dilkie et al.         |
|             |         |                   | 6,391,102 B1 | 5/2002  | Bodden et al.         |
|             |         |                   | 6,434,416 B1 | 8/2002  | Mizoguchi et al.      |
|             |         |                   | 6,443,973 B1 | 9/2002  | Whitman               |
|             |         |                   | 6,451,015 B1 | 9/2002  | Rittman, III et al.   |



(56)

## References Cited

## U.S. PATENT DOCUMENTS

|              |         |                     |              |         |                         |
|--------------|---------|---------------------|--------------|---------|-------------------------|
| 6,454,781 B1 | 9/2002  | Witt et al.         | 7,177,533 B2 | 2/2007  | McFarlin et al.         |
| 6,457,625 B1 | 10/2002 | Tormala et al.      | 7,182,775 B2 | 2/2007  | de Guillebon et al.     |
| 6,461,352 B2 | 10/2002 | Morgan et al.       | 7,207,472 B2 | 4/2007  | Wukusick et al.         |
| 6,466,817 B1 | 10/2002 | Kaula et al.        | 7,208,005 B2 | 4/2007  | Frecker et al.          |
| 6,480,796 B2 | 11/2002 | Wiener              | 7,217,269 B2 | 5/2007  | El-Galley et al.        |
| 6,524,307 B1 | 2/2003  | Palmerton et al.    | 7,230,529 B2 | 6/2007  | Ketcherside, Jr. et al. |
| 6,530,933 B1 | 3/2003  | Yeung et al.        | 7,232,447 B2 | 6/2007  | Gellman et al.          |
| 6,551,243 B2 | 4/2003  | Bocioneck et al.    | 7,236,817 B2 | 6/2007  | Papas et al.            |
| 6,569,109 B2 | 5/2003  | Sakurai et al.      | 7,246,734 B2 | 7/2007  | Shelton, IV             |
| 6,582,424 B2 | 6/2003  | Fleenor et al.      | 7,252,664 B2 | 8/2007  | Nasab et al.            |
| 6,584,358 B2 | 6/2003  | Carter et al.       | 7,278,563 B1 | 10/2007 | Green                   |
| 6,585,791 B1 | 7/2003  | Garito et al.       | 7,294,106 B2 | 11/2007 | Birkenbach et al.       |
| 6,611,793 B1 | 8/2003  | Burnside et al.     | 7,294,116 B1 | 11/2007 | Ellman et al.           |
| 6,618,626 B2 | 9/2003  | West, Jr. et al.    | 7,296,724 B2 | 11/2007 | Green et al.            |
| 6,633,234 B2 | 10/2003 | Wiener et al.       | 7,317,955 B2 | 1/2008  | McGreevy                |
| 6,648,223 B2 | 11/2003 | Boukhny et al.      | 7,328,828 B2 | 2/2008  | Ortiz et al.            |
| 6,678,552 B2 | 1/2004  | Pearlman            | 7,334,717 B2 | 2/2008  | Rethy et al.            |
| 6,679,899 B2 | 1/2004  | Wiener et al.       | 7,343,565 B2 | 3/2008  | Ying et al.             |
| 6,685,704 B2 | 2/2004  | Greep               | 7,344,532 B2 | 3/2008  | Goble et al.            |
| 6,699,187 B2 | 3/2004  | Webb et al.         | 7,353,068 B2 | 4/2008  | Tanaka et al.           |
| 6,731,514 B2 | 5/2004  | Evans               | 7,362,228 B2 | 4/2008  | Nycz et al.             |
| 6,742,895 B2 | 6/2004  | Robin               | 7,371,227 B2 | 5/2008  | Zeiner                  |
| 6,752,816 B2 | 6/2004  | Culp et al.         | 7,380,695 B2 | 6/2008  | Doll et al.             |
| 6,760,616 B2 | 7/2004  | Hoey et al.         | 7,383,088 B2 | 6/2008  | Spinelli et al.         |
| 6,770,072 B1 | 8/2004  | Truckai et al.      | 7,391,173 B2 | 6/2008  | Schena                  |
| 6,773,444 B2 | 8/2004  | Messerly            | 7,407,074 B2 | 8/2008  | Ortiz et al.            |
| 6,775,575 B2 | 8/2004  | Bommannan et al.    | 7,408,439 B2 | 8/2008  | Wang et al.             |
| 6,778,846 B1 | 8/2004  | Martinez et al.     | 7,422,136 B1 | 9/2008  | Marczyk                 |
| 6,781,683 B2 | 8/2004  | Kacyra et al.       | 7,422,139 B2 | 9/2008  | Shelton, IV et al.      |
| 6,783,524 B2 | 8/2004  | Anderson et al.     | 7,423,972 B2 | 9/2008  | Shaham et al.           |
| 6,783,525 B2 | 8/2004  | Greep et al.        | D579,876 S   | 11/2008 | Novotney et al.         |
| 6,793,663 B2 | 9/2004  | Kneifel et al.      | 7,457,804 B2 | 11/2008 | Uber, III et al.        |
| 6,824,539 B2 | 11/2004 | Novak               | D583,328 S   | 12/2008 | Chiang                  |
| 6,846,308 B2 | 1/2005  | Whitman et al.      | 7,464,847 B2 | 12/2008 | Viola et al.            |
| 6,849,074 B2 | 2/2005  | Chen et al.         | 7,464,849 B2 | 12/2008 | Shelton, IV et al.      |
| 6,852,219 B2 | 2/2005  | Hammond             | 7,496,418 B2 | 2/2009  | Kim et al.              |
| 6,863,650 B1 | 3/2005  | Irion               | D589,447 S   | 3/2009  | Sasada et al.           |
| 6,869,430 B2 | 3/2005  | Balbierz et al.     | 7,515,961 B2 | 4/2009  | Germanson et al.        |
| 6,869,435 B2 | 3/2005  | Blake, III          | 7,518,502 B2 | 4/2009  | Austin et al.           |
| 6,911,033 B2 | 6/2005  | de Guillebon et al. | 7,563,259 B2 | 7/2009  | Takahashi               |
| 6,913,471 B2 | 7/2005  | Smith               | 7,568,604 B2 | 8/2009  | Ehrenfels et al.        |
| 6,937,892 B2 | 8/2005  | Leyde et al.        | 7,575,144 B2 | 8/2009  | Ortiz et al.            |
| 6,945,981 B2 | 9/2005  | Donofrio et al.     | 7,597,731 B2 | 10/2009 | Palmerton et al.        |
| 6,951,559 B1 | 10/2005 | Greep               | 7,617,137 B2 | 11/2009 | Kreiner et al.          |
| 6,962,587 B2 | 11/2005 | Johnson et al.      | 7,621,192 B2 | 11/2009 | Conti et al.            |
| 6,978,921 B2 | 12/2005 | Shelton, IV et al.  | 7,621,898 B2 | 11/2009 | Lalomia et al.          |
| 6,988,649 B2 | 1/2006  | Shelton, IV et al.  | 7,631,793 B2 | 12/2009 | Rethy et al.            |
| 7,000,818 B2 | 2/2006  | Shelton, IV et al.  | 7,637,410 B2 | 12/2009 | Marczyk                 |
| 7,009,511 B2 | 3/2006  | Mazar et al.        | 7,637,907 B2 | 12/2009 | Blaha                   |
| 7,030,146 B2 | 4/2006  | Baynes et al.       | 7,641,092 B2 | 1/2010  | Kruszynski et al.       |
| 7,032,798 B2 | 4/2006  | Whitman et al.      | 7,644,848 B2 | 1/2010  | Swayze et al.           |
| 7,041,941 B2 | 5/2006  | Faries, Jr. et al.  | 7,667,592 B2 | 2/2010  | Ohyama et al.           |
| 7,044,352 B2 | 5/2006  | Shelton, IV et al.  | 7,667,839 B2 | 2/2010  | Bates                   |
| 7,044,911 B2 | 5/2006  | Drinan et al.       | 7,670,334 B2 | 3/2010  | Hueil et al.            |
| 7,044,949 B2 | 5/2006  | Orszulak et al.     | 7,694,865 B2 | 4/2010  | Scirica                 |
| 7,048,775 B2 | 5/2006  | Jornitz et al.      | 7,699,860 B2 | 4/2010  | Huitema et al.          |
| 7,053,752 B2 | 5/2006  | Wang et al.         | 7,720,306 B2 | 5/2010  | Gardiner et al.         |
| 7,055,730 B2 | 6/2006  | Ehrenfels et al.    | 7,721,934 B2 | 5/2010  | Shelton, IV et al.      |
| 7,073,765 B2 | 7/2006  | Newkirk             | 7,721,936 B2 | 5/2010  | Shalton, IV et al.      |
| 7,077,853 B2 | 7/2006  | Kramer et al.       | 7,736,357 B2 | 6/2010  | Lee, Jr. et al.         |
| 7,077,856 B2 | 7/2006  | Whitman             | 7,742,176 B2 | 6/2010  | Braunecker et al.       |
| 7,081,096 B2 | 7/2006  | Brister et al.      | 7,743,960 B2 | 6/2010  | Whitman et al.          |
| 7,097,640 B2 | 8/2006  | Wang et al.         | 7,753,245 B2 | 7/2010  | Boudreaux et al.        |
| 7,103,688 B2 | 9/2006  | Strong              | 7,757,028 B2 | 7/2010  | Druke et al.            |
| 7,104,949 B2 | 9/2006  | Anderson et al.     | 7,766,207 B2 | 8/2010  | Mather et al.           |
| 7,118,564 B2 | 10/2006 | Ritchie et al.      | 7,766,905 B2 | 8/2010  | Paterson et al.         |
| 7,121,460 B1 | 10/2006 | Parsons et al.      | 7,770,773 B2 | 8/2010  | Whitman et al.          |
| 7,137,980 B2 | 11/2006 | Buyse et al.        | 7,771,429 B2 | 8/2010  | Ballard et al.          |
| 7,140,528 B2 | 11/2006 | Shelton, IV         | 7,776,037 B2 | 8/2010  | Odom                    |
| 7,143,923 B2 | 12/2006 | Shelton, IV et al.  | 7,782,789 B2 | 8/2010  | Stultz et al.           |
| 7,143,925 B2 | 12/2006 | Shelton, IV et al.  | 7,784,663 B2 | 8/2010  | Shelton, IV             |
| 7,147,139 B2 | 12/2006 | Schwemberger et al. | 7,803,151 B2 | 9/2010  | Whitman                 |
| 7,155,316 B2 | 12/2006 | Sutherland et al.   | 7,810,692 B2 | 10/2010 | Hall et al.             |
| 7,164,940 B2 | 1/2007  | Hareyama et al.     | 7,818,041 B2 | 10/2010 | Kim et al.              |
| 7,169,145 B2 | 1/2007  | Isaacson et al.     | 7,819,298 B2 | 10/2010 | Hall et al.             |
|              |         |                     | 7,832,612 B2 | 11/2010 | Baxter, III et al.      |
|              |         |                     | 7,833,219 B2 | 11/2010 | Tashiro et al.          |
|              |         |                     | 7,836,085 B2 | 11/2010 | Petakov et al.          |
|              |         |                     | 7,837,079 B2 | 11/2010 | Holsten et al.          |



(56)

## References Cited

## U.S. PATENT DOCUMENTS

|              |         |                       |              |         |                    |
|--------------|---------|-----------------------|--------------|---------|--------------------|
| 7,837,680 B2 | 11/2010 | Isaacson et al.       | 8,181,839 B2 | 5/2012  | Beetel             |
| 7,841,980 B2 | 11/2010 | Minosawa et al.       | 8,185,409 B2 | 5/2012  | Putnam et al.      |
| 7,845,537 B2 | 12/2010 | Shelton, IV et al.    | 8,206,345 B2 | 6/2012  | Abboud et al.      |
| 7,857,185 B2 | 12/2010 | Swayze et al.         | 8,208,707 B2 | 6/2012  | Mendonca et al.    |
| D631,252 S   | 1/2011  | Leslie                | 8,210,411 B2 | 7/2012  | Yates et al.       |
| 7,862,560 B2 | 1/2011  | Marion                | 8,214,007 B2 | 7/2012  | Baker et al.       |
| 7,862,579 B2 | 1/2011  | Ortiz et al.          | 8,216,849 B2 | 7/2012  | Petty              |
| 7,865,236 B2 | 1/2011  | Cory et al.           | 8,220,688 B2 | 7/2012  | Laurent et al.     |
| 7,884,735 B2 | 2/2011  | Newkirk               | 8,225,643 B2 | 7/2012  | Abboud et al.      |
| 7,887,530 B2 | 2/2011  | Zemlok et al.         | 8,225,979 B2 | 7/2012  | Farascioni et al.  |
| 7,892,337 B2 | 2/2011  | Palmerton et al.      | 8,229,549 B2 | 7/2012  | Whitman et al.     |
| 7,907,166 B2 | 3/2011  | Lamprecht et al.      | 8,231,042 B2 | 7/2012  | Hessler et al.     |
| 7,913,891 B2 | 3/2011  | Doll et al.           | 8,239,066 B2 | 8/2012  | Jennings et al.    |
| 7,918,230 B2 | 4/2011  | Whitman et al.        | 8,241,322 B2 | 8/2012  | Whitman et al.     |
| 7,918,377 B2 | 4/2011  | Measamer et al.       | 8,255,045 B2 | 8/2012  | Gharib et al.      |
| 7,920,706 B2 | 4/2011  | Asokan et al.         | D667,838 S   | 9/2012  | Magee et al.       |
| 7,927,014 B2 | 4/2011  | Dehler                | 8,257,387 B2 | 9/2012  | Cunningham         |
| 7,932,826 B2 | 4/2011  | Fritchie et al.       | 8,260,016 B2 | 9/2012  | Maeda et al.       |
| 7,942,300 B2 | 5/2011  | Rethy et al.          | 8,262,560 B2 | 9/2012  | Whitman            |
| 7,945,065 B2 | 5/2011  | Menzl et al.          | 8,292,639 B2 | 10/2012 | Achammer et al.    |
| 7,945,342 B2 | 5/2011  | Tsai et al.           | 8,292,888 B2 | 10/2012 | Whitman            |
| 7,951,148 B2 | 5/2011  | McClurken             | 8,295,902 B2 | 10/2012 | Salahieh et al.    |
| 7,954,682 B2 | 6/2011  | Giordano et al.       | 8,308,040 B2 | 11/2012 | Huang et al.       |
| 7,955,322 B2 | 6/2011  | Devengenzo et al.     | 8,321,581 B2 | 11/2012 | Katis et al.       |
| 7,956,620 B2 | 6/2011  | Gilbert               | 8,322,590 B2 | 12/2012 | Patel et al.       |
| 7,963,433 B2 | 6/2011  | Whitman et al.        | 8,328,065 B2 | 12/2012 | Shah               |
| 7,966,269 B2 | 6/2011  | Bauer et al.          | 8,335,590 B2 | 12/2012 | Costa et al.       |
| 7,967,180 B2 | 6/2011  | Scirica               | D675,164 S   | 1/2013  | Kobayashi et al.   |
| 7,976,553 B2 | 7/2011  | Shelton, IV et al.    | 8,343,065 B2 | 1/2013  | Bartol et al.      |
| 7,979,157 B2 | 7/2011  | Anvari                | 8,346,392 B2 | 1/2013  | Walser et al.      |
| 7,980,443 B2 | 7/2011  | Scheib et al.         | 8,360,299 B2 | 1/2013  | Zemlok et al.      |
| 7,982,776 B2 | 7/2011  | Dunki-Jacobs et al.   | 8,364,222 B2 | 1/2013  | Cook et al.        |
| 7,988,028 B2 | 8/2011  | Farascioni et al.     | D676,392 S   | 2/2013  | Gassauer           |
| 7,993,140 B2 | 8/2011  | Sakezles              | 8,365,975 B1 | 2/2013  | Manoux et al.      |
| 7,995,045 B2 | 8/2011  | Dunki-Jacobs          | D678,196 S   | 3/2013  | Miyauchi et al.    |
| 8,005,947 B2 | 8/2011  | Morris et al.         | D678,304 S   | 3/2013  | Yakoub et al.      |
| 8,007,494 B1 | 8/2011  | Taylor et al.         | 8,388,652 B2 | 3/2013  | Viola              |
| 8,007,513 B2 | 8/2011  | Nalagatla et al.      | 8,393,514 B2 | 3/2013  | Shelton, IV et al. |
| 8,010,180 B2 | 8/2011  | Quaid et al.          | 8,397,972 B2 | 3/2013  | Kostrzewski        |
| 8,012,170 B2 | 9/2011  | Whitman et al.        | 8,398,541 B2 | 3/2013  | DiMaio et al.      |
| 8,015,976 B2 | 9/2011  | Shah                  | 8,403,944 B2 | 3/2013  | Pain et al.        |
| 8,016,855 B2 | 9/2011  | Whitman et al.        | 8,403,945 B2 | 3/2013  | Whitfield et al.   |
| 8,019,094 B2 | 9/2011  | Hsieh et al.          | 8,403,946 B2 | 3/2013  | Whitfield et al.   |
| 8,025,199 B2 | 9/2011  | Whitman et al.        | 8,406,859 B2 | 3/2013  | Zuzak et al.       |
| 8,027,710 B1 | 9/2011  | Dannan                | 8,411,034 B2 | 4/2013  | Boillot et al.     |
| 8,035,685 B2 | 10/2011 | Jensen                | 8,413,871 B2 | 4/2013  | Racenet et al.     |
| 8,038,686 B2 | 10/2011 | Huitema et al.        | 8,422,035 B2 | 4/2013  | Hinderling et al.  |
| 8,038,693 B2 | 10/2011 | Allen                 | 8,423,182 B2 | 4/2013  | Robinson et al.    |
| 8,043,560 B2 | 10/2011 | Okumoto et al.        | 8,428,722 B2 | 4/2013  | Verhoef et al.     |
| 8,054,184 B2 | 11/2011 | Cline et al.          | 8,429,153 B2 | 4/2013  | Birdwell et al.    |
| 8,054,752 B2 | 11/2011 | Druke et al.          | 8,439,910 B2 | 5/2013  | Greep et al.       |
| 8,062,306 B2 | 11/2011 | Nobis et al.          | 8,444,663 B2 | 5/2013  | Houser et al.      |
| 8,062,330 B2 | 11/2011 | Prommersberger et al. | 8,452,615 B2 | 5/2013  | Abri               |
| 8,066,721 B2 | 11/2011 | Kortenbach et al.     | 8,454,506 B2 | 6/2013  | Rothman et al.     |
| 8,074,861 B2 | 12/2011 | Ehrenfels et al.      | 8,461,744 B2 | 6/2013  | Wiener et al.      |
| 8,075,571 B2 | 12/2011 | Vitali et al.         | 8,468,030 B2 | 6/2013  | Stroup et al.      |
| 8,096,459 B2 | 1/2012  | Ortiz et al.          | 8,469,973 B2 | 6/2013  | Meade et al.       |
| 8,118,206 B2 | 2/2012  | Zand et al.           | 8,472,630 B2 | 6/2013  | Konrad et al.      |
| 8,120,301 B2 | 2/2012  | Goldberg et al.       | D687,146 S   | 7/2013  | Juzkiw et al.      |
| 8,123,764 B2 | 2/2012  | Meade et al.          | 8,476,227 B2 | 7/2013  | Kaplan et al.      |
| D655,678 S   | 3/2012  | Kobayashi et al.      | 8,489,235 B2 | 7/2013  | Moll et al.        |
| 8,128,625 B2 | 3/2012  | Odom                  | 8,499,992 B2 | 8/2013  | Whitman et al.     |
| 8,131,565 B2 | 3/2012  | Dicks et al.          | 8,500,728 B2 | 8/2013  | Newton et al.      |
| 8,136,712 B2 | 3/2012  | Zingman               | 8,500,756 B2 | 8/2013  | Papa et al.        |
| D657,368 S   | 4/2012  | Magee et al.          | 8,503,759 B2 | 8/2013  | Greer et al.       |
| 8,147,486 B2 | 4/2012  | Honour et al.         | 8,505,801 B2 | 8/2013  | Ehrenfels et al.   |
| 8,155,479 B2 | 4/2012  | Hoffman et al.        | 8,506,478 B2 | 8/2013  | Mizuyoshi          |
| 8,157,145 B2 | 4/2012  | Shelton, IV et al.    | 8,512,325 B2 | 8/2013  | Mathonnet          |
| 8,157,150 B2 | 4/2012  | Viola et al.          | 8,512,365 B2 | 8/2013  | Wiener et al.      |
| 8,157,151 B2 | 4/2012  | Ingmanson et al.      | 8,515,520 B2 | 8/2013  | Brunnett et al.    |
| 8,160,098 B1 | 4/2012  | Yan et al.            | 8,517,239 B2 | 8/2013  | Scheib et al.      |
| 8,160,690 B2 | 4/2012  | Wilfley et al.        | 8,521,331 B2 | 8/2013  | Itkowitz           |
| 8,161,977 B2 | 4/2012  | Shelton, IV et al.    | 8,523,043 B2 | 9/2013  | Ullrich et al.     |
| 8,170,396 B2 | 5/2012  | Kuspa et al.          | 8,540,709 B2 | 9/2013  | Allen              |
| 8,172,836 B2 | 5/2012  | Ward                  | 8,546,996 B2 | 10/2013 | Messerly et al.    |
|              |         |                       | 8,554,697 B2 | 10/2013 | Claus et al.       |
|              |         |                       | 8,560,047 B2 | 10/2013 | Haider et al.      |
|              |         |                       | 8,561,870 B2 | 10/2013 | Baxter, III et al. |
|              |         |                       | 8,562,598 B2 | 10/2013 | Falkenstein et al. |



(56)

**References Cited**

## U.S. PATENT DOCUMENTS

|              |         |                     |              |         |                    |
|--------------|---------|---------------------|--------------|---------|--------------------|
| 8,566,115 B2 | 10/2013 | Moore               | 8,875,973 B2 | 11/2014 | Whitman            |
| 8,567,393 B2 | 10/2013 | Hickle et al.       | 8,882,662 B2 | 11/2014 | Charles            |
| 8,571,598 B2 | 10/2013 | Valavi              | 8,886,790 B2 | 11/2014 | Harrang et al.     |
| 8,573,459 B2 | 11/2013 | Smith et al.        | 8,893,949 B2 | 11/2014 | Shelton, IV et al. |
| 8,573,465 B2 | 11/2013 | Shelton, IV         | 8,899,479 B2 | 12/2014 | Cappuzzo et al.    |
| 8,574,229 B2 | 11/2013 | Eder et al.         | 8,905,977 B2 | 12/2014 | Shelton et al.     |
| 8,585,694 B2 | 11/2013 | Amoah et al.        | 8,912,746 B2 | 12/2014 | Reid et al.        |
| 8,590,762 B2 | 11/2013 | Hess et al.         | 8,914,098 B2 | 12/2014 | Brennan et al.     |
| 8,591,536 B2 | 11/2013 | Robertson           | 8,917,513 B1 | 12/2014 | Hazzard            |
| 8,595,607 B2 | 11/2013 | Nekoomaram et al.   | 8,918,207 B2 | 12/2014 | Prisco             |
| 8,596,513 B2 | 12/2013 | Olson et al.        | 8,920,186 B2 | 12/2014 | Shishikura         |
| 8,596,515 B2 | 12/2013 | Okoniewski          | 8,920,414 B2 | 12/2014 | Stone et al.       |
| 8,604,709 B2 | 12/2013 | Jalbout et al.      | 8,920,433 B2 | 12/2014 | Barrier et al.     |
| 8,608,044 B2 | 12/2013 | Hueil et al.        | 8,930,203 B2 | 1/2015  | Kiaie et al.       |
| 8,608,045 B2 | 12/2013 | Smith et al.        | 8,930,214 B2 | 1/2015  | Woolford           |
| 8,616,431 B2 | 12/2013 | Timm et al.         | 8,931,679 B2 | 1/2015  | Kostrzewski        |
| 8,620,055 B2 | 12/2013 | Barratt et al.      | 8,936,614 B2 | 1/2015  | Allen, IV          |
| 8,620,473 B2 | 12/2013 | Diolaiti et al.     | 8,945,095 B2 | 2/2015  | Blumenkranz et al. |
| 8,623,027 B2 | 1/2014  | Price et al.        | 8,945,163 B2 | 2/2015  | Voegele et al.     |
| 8,627,483 B2 | 1/2014  | Rachlin et al.      | 8,955,732 B2 | 2/2015  | Zemlok et al.      |
| 8,627,993 B2 | 1/2014  | Smith et al.        | 8,956,581 B2 | 2/2015  | Rosenbaum et al.   |
| 8,627,995 B2 | 1/2014  | Smith et al.        | 8,960,519 B2 | 2/2015  | Whitman et al.     |
| 8,628,518 B2 | 1/2014  | Blumenkranz et al.  | 8,960,520 B2 | 2/2015  | McCuen             |
| 8,628,545 B2 | 1/2014  | Cabrera et al.      | 8,962,062 B2 | 2/2015  | Podhajsky et al.   |
| 8,631,987 B2 | 1/2014  | Shelton, IV et al.  | 8,967,443 B2 | 3/2015  | McCuen             |
| 8,632,525 B2 | 1/2014  | Kerr et al.         | 8,967,455 B2 | 3/2015  | Zhou               |
| 8,636,190 B2 | 1/2014  | Zemlok et al.       | 8,968,276 B2 | 3/2015  | Zemlok et al.      |
| 8,636,736 B2 | 1/2014  | Yates et al.        | 8,968,296 B2 | 3/2015  | McPherson          |
| 8,641,621 B2 | 2/2014  | Razzaque et al.     | 8,968,309 B2 | 3/2015  | Roy et al.         |
| 8,652,086 B2 | 2/2014  | Gerg et al.         | 8,968,312 B2 | 3/2015  | Marczyk et al.     |
| 8,652,121 B2 | 2/2014  | Quick et al.        | 8,968,337 B2 | 3/2015  | Whitfield et al.   |
| 8,652,128 B2 | 2/2014  | Ward                | 8,968,358 B2 | 3/2015  | Reschke            |
| 8,657,176 B2 | 2/2014  | Shelton, IV et al.  | 8,974,429 B2 | 3/2015  | Gordon et al.      |
| 8,657,177 B2 | 2/2014  | Scirica et al.      | 8,979,890 B2 | 3/2015  | Boudreaux          |
| 8,663,220 B2 | 3/2014  | Wiener et al.       | 8,986,288 B2 | 3/2015  | Konishi            |
| 8,666,544 B2 | 3/2014  | Moll et al.         | 8,986,302 B2 | 3/2015  | Aldridge et al.    |
| 8,679,114 B2 | 3/2014  | Chapman et al.      | 8,989,903 B2 | 3/2015  | Weir et al.        |
| 8,682,049 B2 | 3/2014  | Zhao et al.         | 8,991,678 B2 | 3/2015  | Wellman et al.     |
| 8,682,489 B2 | 3/2014  | Itkowitz et al.     | 8,992,565 B2 | 3/2015  | Brisson et al.     |
| 8,685,056 B2 | 4/2014  | Evans et al.        | 8,998,797 B2 | 4/2015  | Omori              |
| 8,688,188 B2 | 4/2014  | Heller et al.       | 9,002,518 B2 | 4/2015  | Manzo et al.       |
| 8,690,864 B2 | 4/2014  | Hoarau              | 9,010,611 B2 | 4/2015  | Ross et al.        |
| 8,701,962 B2 | 4/2014  | Kostrzewski         | 9,011,366 B2 | 4/2015  | Dean et al.        |
| D704,839 S   | 5/2014  | Juzkiw et al.       | 9,011,427 B2 | 4/2015  | Price et al.       |
| 8,719,061 B2 | 5/2014  | Birchall            | 9,016,539 B2 | 4/2015  | Kostrzewski et al. |
| 8,720,766 B2 | 5/2014  | Hess et al.         | 9,017,326 B2 | 4/2015  | DiNardo et al.     |
| 8,733,613 B2 | 5/2014  | Huitema et al.      | 9,020,240 B2 | 4/2015  | Pettersson et al.  |
| 8,740,840 B2 | 6/2014  | Foley et al.        | D729,267 S   | 5/2015  | Yoo et al.         |
| 8,740,866 B2 | 6/2014  | Reasoner et al.     | 9,023,032 B2 | 5/2015  | Robinson           |
| 8,747,238 B2 | 6/2014  | Shelton, IV et al.  | 9,023,071 B2 | 5/2015  | Miller et al.      |
| 8,752,749 B2 | 6/2014  | Moore et al.        | 9,027,431 B2 | 5/2015  | Tang et al.        |
| 8,757,465 B2 | 6/2014  | Woodard, Jr. et al. | 9,028,494 B2 | 5/2015  | Shelton, IV et al. |
| 8,761,717 B1 | 6/2014  | Buchheit            | 9,035,568 B2 | 5/2015  | Ganton et al.      |
| 8,763,879 B2 | 7/2014  | Shelton, IV et al.  | 9,038,882 B2 | 5/2015  | Racenet et al.     |
| 8,768,251 B2 | 7/2014  | Claus et al.        | 9,043,027 B2 | 5/2015  | Durant et al.      |
| 8,771,270 B2 | 7/2014  | Burbank             | 9,044,227 B2 | 6/2015  | Shelton, IV et al. |
| 8,775,196 B2 | 7/2014  | Simpson et al.      | 9,044,244 B2 | 6/2015  | Ludwin et al.      |
| 8,779,648 B2 | 7/2014  | Giordano et al.     | 9,044,261 B2 | 6/2015  | Houser             |
| 8,790,253 B2 | 7/2014  | Sunagawa et al.     | 9,050,063 B2 | 6/2015  | Roe et al.         |
| 8,794,497 B2 | 8/2014  | Zingman             | 9,050,083 B2 | 6/2015  | Yates et al.       |
| 8,795,001 B1 | 8/2014  | Lam et al.          | 9,050,120 B2 | 6/2015  | Swarup et al.      |
| 8,799,008 B2 | 8/2014  | Johnson et al.      | 9,052,809 B2 | 6/2015  | Vesto              |
| 8,799,009 B2 | 8/2014  | Mellin et al.       | 9,055,035 B2 | 6/2015  | Porsch et al.      |
| 8,800,838 B2 | 8/2014  | Shelton, IV         | 9,055,870 B2 | 6/2015  | Meador et al.      |
| 8,801,703 B2 | 8/2014  | Gregg et al.        | 9,060,770 B2 | 6/2015  | Shelton, IV et al. |
| 8,814,996 B2 | 8/2014  | Giurgiutiu et al.   | 9,060,775 B2 | 6/2015  | Wiener et al.      |
| 8,818,556 B2 | 8/2014  | Sanchez et al.      | 9,066,650 B2 | 6/2015  | Sekiguchi          |
| 8,819,581 B2 | 8/2014  | Nakamura et al.     | 9,072,523 B2 | 7/2015  | Houser et al.      |
| 8,820,603 B2 | 9/2014  | Shelton, IV et al.  | 9,072,535 B2 | 7/2015  | Shelton, IV et al. |
| 8,820,608 B2 | 9/2014  | Miyamoto            | 9,072,536 B2 | 7/2015  | Shelton, IV et al. |
| 8,827,134 B2 | 9/2014  | Viola et al.        | 9,078,653 B2 | 7/2015  | Leimbach et al.    |
| 8,840,003 B2 | 9/2014  | Morgan et al.       | 9,078,727 B2 | 7/2015  | Miller             |
| D716,333 S   | 10/2014 | Chotin et al.       | 9,084,606 B2 | 7/2015  | Greep              |
| 8,851,354 B2 | 10/2014 | Swensgard et al.    | 9,089,360 B2 | 7/2015  | Messerly et al.    |
| 8,852,174 B2 | 10/2014 | Burbank             | 9,095,362 B2 | 8/2015  | Dachs, II et al.   |
|              |         |                     | 9,095,367 B2 | 8/2015  | Olson et al.       |
|              |         |                     | 9,099,863 B2 | 8/2015  | Smith et al.       |
|              |         |                     | 9,101,358 B2 | 8/2015  | Kerr et al.        |
|              |         |                     | 9,101,359 B2 | 8/2015  | Smith et al.       |



(56)

## References Cited

## U.S. PATENT DOCUMENTS

|                |         |                          |              |         |                         |
|----------------|---------|--------------------------|--------------|---------|-------------------------|
| 9,101,374 B1   | 8/2015  | Hoch et al.              | 9,302,213 B2 | 4/2016  | Manahan et al.          |
| 9,106,270 B2   | 8/2015  | Puterbaugh et al.        | 9,307,894 B2 | 4/2016  | von Grunberg et al.     |
| 9,107,573 B2   | 8/2015  | Birnkrant                | 9,307,914 B2 | 4/2016  | Fahey                   |
| 9,107,662 B2   | 8/2015  | Kostrzewski              | 9,307,986 B2 | 4/2016  | Hall et al.             |
| 9,107,684 B2   | 8/2015  | Ma                       | 9,314,246 B2 | 4/2016  | Shelton, IV et al.      |
| 9,107,688 B2   | 8/2015  | Kimball et al.           | 9,314,308 B2 | 4/2016  | Parihar et al.          |
| 9,107,689 B2   | 8/2015  | Robertson et al.         | 9,320,563 B2 | 4/2016  | Brustad et al.          |
| 9,107,694 B2   | 8/2015  | Hendriks et al.          | 9,325,732 B1 | 4/2016  | Stickle et al.          |
| 9,111,548 B2   | 8/2015  | Nandy et al.             | 9,326,767 B2 | 5/2016  | Koch et al.             |
| 9,113,880 B2   | 8/2015  | Zemlok et al.            | 9,326,770 B2 | 5/2016  | Shelton, IV et al.      |
| 9,114,494 B1   | 8/2015  | Mah                      | 9,331,422 B2 | 5/2016  | Nazzaro et al.          |
| 9,116,597 B1   | 8/2015  | Gulasky                  | 9,332,987 B2 | 5/2016  | Leimbach et al.         |
| 9,119,617 B2   | 9/2015  | Souls et al.             | 9,333,042 B2 | 5/2016  | Diolaiti et al.         |
| 9,119,655 B2   | 9/2015  | Bowling et al.           | 9,336,385 B1 | 5/2016  | Spencer et al.          |
| 9,119,657 B2   | 9/2015  | Shelton, IV et al.       | 9,341,704 B2 | 5/2016  | Picard et al.           |
| 9,123,155 B2   | 9/2015  | Cunningham et al.        | 9,345,481 B2 | 5/2016  | Hall et al.             |
| 9,125,644 B2   | 9/2015  | Lane et al.              | 9,345,490 B2 | 5/2016  | Ippisch                 |
| 9,129,054 B2   | 9/2015  | Nawana et al.            | 9,345,546 B2 | 5/2016  | Toth et al.             |
| 9,137,254 B2   | 9/2015  | Bilbrey et al.           | 9,345,900 B2 | 5/2016  | Wu et al.               |
| 9,138,129 B2   | 9/2015  | Diolaiti                 | 9,351,726 B2 | 5/2016  | Leimbach et al.         |
| 9,138,225 B2   | 9/2015  | Huang et al.             | 9,351,727 B2 | 5/2016  | Leimbach et al.         |
| 9,149,322 B2   | 10/2015 | Knowlton                 | 9,358,003 B2 | 6/2016  | Hall et al.             |
| 9,155,503 B2   | 10/2015 | Cadwell                  | 9,358,685 B2 | 6/2016  | Meier et al.            |
| 9,160,853 B1   | 10/2015 | Daddi et al.             | 9,360,449 B2 | 6/2016  | Duric                   |
| 9,161,803 B2   | 10/2015 | Yates et al.             | 9,364,231 B2 | 6/2016  | Wenchell                |
| 9,168,054 B2   | 10/2015 | Turner et al.            | 9,364,249 B2 | 6/2016  | Kimball et al.          |
| 9,168,091 B2   | 10/2015 | Janssen et al.           | 9,364,294 B2 | 6/2016  | Razzaque et al.         |
| 9,168,104 B2   | 10/2015 | Dein                     | 9,370,400 B2 | 6/2016  | Parihar                 |
| 9,179,912 B2   | 11/2015 | Yates et al.             | 9,375,282 B2 | 6/2016  | Nau, Jr. et al.         |
| 9,183,723 B2   | 11/2015 | Sherman et al.           | 9,375,539 B2 | 6/2016  | Stearns et al.          |
| 9,186,143 B2   | 11/2015 | Timm et al.              | 9,381,003 B2 | 7/2016  | Todor et al.            |
| 9,192,375 B2   | 11/2015 | Skinlo et al.            | 9,381,058 B2 | 7/2016  | Houser et al.           |
| 9,192,447 B2   | 11/2015 | Choi et al.              | 9,386,984 B2 | 7/2016  | Aronhalt et al.         |
| 9,192,707 B2   | 11/2015 | Gerber et al.            | 9,386,988 B2 | 7/2016  | Baxter, III et al.      |
| 9,198,711 B2   | 12/2015 | Joseph                   | 9,387,295 B1 | 7/2016  | Mastri et al.           |
| 9,202,078 B2   | 12/2015 | Abuelsaad et al.         | 9,393,017 B2 | 7/2016  | Flanagan et al.         |
| 9,204,830 B2   | 12/2015 | Zand et al.              | 9,393,037 B2 | 7/2016  | Olson et al.            |
| 9,204,879 B2   | 12/2015 | Shelton, IV              | 9,398,905 B2 | 7/2016  | Martin                  |
| 9,204,995 B2   | 12/2015 | Scheller et al.          | 9,398,911 B2 | 7/2016  | Auld                    |
| 9,211,120 B2 * | 12/2015 | Scheib ..... A61B 17/072 | 9,402,629 B2 | 8/2016  | Ehrenfels et al.        |
| 9,216,062 B2   | 12/2015 | Duque et al.             | 9,414,776 B2 | 8/2016  | Sillay et al.           |
| 9,218,053 B2   | 12/2015 | Komuro et al.            | 9,414,940 B2 | 8/2016  | Stein et al.            |
| 9,220,502 B2   | 12/2015 | Zemlok et al.            | 9,419,018 B2 | 8/2016  | Sasagawa et al.         |
| 9,226,689 B2   | 1/2016  | Jacobsen et al.          | 9,421,014 B2 | 8/2016  | Ingmanson et al.        |
| 9,226,751 B2   | 1/2016  | Shelton, IV et al.       | 9,433,470 B2 | 9/2016  | Choi                    |
| 9,226,766 B2   | 1/2016  | Aldridge et al.          | 9,439,622 B2 | 9/2016  | Case et al.             |
| 9,226,767 B2   | 1/2016  | Stulen et al.            | 9,439,668 B2 | 9/2016  | Timm et al.             |
| 9,226,791 B2   | 1/2016  | McCarthy et al.          | 9,439,736 B2 | 9/2016  | Olson                   |
| 9,232,883 B2   | 1/2016  | Ozawa et al.             | 9,445,764 B2 | 9/2016  | Gross et al.            |
| 9,237,891 B2   | 1/2016  | Shelton, IV              | 9,445,813 B2 | 9/2016  | Shelton, IV et al.      |
| 9,237,921 B2   | 1/2016  | Messerly et al.          | 9,450,701 B2 | 9/2016  | Do et al.               |
| 9,241,728 B2   | 1/2016  | Price et al.             | 9,451,949 B2 | 9/2016  | Gorek et al.            |
| 9,241,730 B2   | 1/2016  | Babaev                   | 9,451,958 B2 | 9/2016  | Shelton, IV et al.      |
| 9,241,731 B2   | 1/2016  | Boudreaux et al.         | 9,463,022 B2 | 10/2016 | Swayze et al.           |
| 9,247,996 B1   | 2/2016  | Merana et al.            | 9,463,646 B2 | 10/2016 | Payne et al.            |
| 9,250,172 B2   | 2/2016  | Harris et al.            | 9,468,438 B2 | 10/2016 | Baber et al.            |
| 9,255,907 B2   | 2/2016  | Heanue et al.            | 9,474,565 B2 | 10/2016 | Shikhman et al.         |
| 9,265,429 B2   | 2/2016  | St. Pierre et al.        | D772,252 S   | 11/2016 | Myers et al.            |
| 9,265,585 B2   | 2/2016  | Wingardner et al.        | 9,480,492 B2 | 11/2016 | Aranyi et al.           |
| 9,272,406 B2   | 3/2016  | Aronhalt et al.          | 9,485,475 B2 | 11/2016 | Speier et al.           |
| 9,277,956 B2   | 3/2016  | Zhang                    | 9,486,271 B2 | 11/2016 | Dunning                 |
| 9,277,961 B2   | 3/2016  | Panescu et al.           | 9,492,146 B2 | 11/2016 | Kostrzewski et al.      |
| 9,277,969 B2   | 3/2016  | Brannan et al.           | 9,492,237 B2 | 11/2016 | Kang et al.             |
| 9,280,884 B1   | 3/2016  | Schultz et al.           | 9,493,807 B2 | 11/2016 | Little et al.           |
| 9,282,962 B2   | 3/2016  | Schmid et al.            | 9,498,182 B2 | 11/2016 | Case et al.             |
| 9,282,974 B2   | 3/2016  | Shelton, IV              | 9,498,215 B2 | 11/2016 | Duque et al.            |
| 9,283,045 B2   | 3/2016  | Rhee et al.              | 9,498,231 B2 | 11/2016 | Haider et al.           |
| 9,283,054 B2   | 3/2016  | Morgan et al.            | 9,516,239 B2 | 12/2016 | Blanquart et al.        |
| 9,289,211 B2   | 3/2016  | Williams et al.          | 9,519,753 B1 | 12/2016 | Gerdeman et al.         |
| 9,289,212 B2   | 3/2016  | Shelton, IV et al.       | 9,522,003 B2 | 12/2016 | Weir et al.             |
| 9,295,514 B2   | 3/2016  | Shelton, IV et al.       | 9,526,407 B2 | 12/2016 | Hoeg et al.             |
| 9,301,691 B2   | 4/2016  | Hufnagel et al.          | 9,526,499 B2 | 12/2016 | Kostrzewski et al.      |
| 9,301,753 B2   | 4/2016  | Aldridge et al.          | 9,526,587 B2 | 12/2016 | Zhao et al.             |
| 9,301,759 B2   | 4/2016  | Spivey et al.            | 9,532,827 B2 | 1/2017  | Morgan et al.           |
| 9,301,810 B2   | 4/2016  | Amiri et al.             | 9,532,845 B1 | 1/2017  | Dossett et al.          |
|                |         |                          | 9,539,007 B2 | 1/2017  | Dhakad et al.           |
|                |         |                          | 9,539,020 B2 | 1/2017  | Conlon et al.           |
|                |         |                          | 9,542,481 B2 | 1/2017  | Halter et al.           |
|                |         |                          | 9,546,662 B2 | 1/2017  | Shener-Irmakoglu et al. |



(56)

**References Cited**

## U.S. PATENT DOCUMENTS

|                |        |                             |              |         |                     |
|----------------|--------|-----------------------------|--------------|---------|---------------------|
| 9,549,781 B2   | 1/2017 | He et al.                   | 9,737,355 B2 | 8/2017  | Yates et al.        |
| 9,554,692 B2   | 1/2017 | Levy                        | 9,740,826 B2 | 8/2017  | Raghavan et al.     |
| 9,554,794 B2   | 1/2017 | Baber et al.                | 9,743,016 B2 | 8/2017  | Nestares et al.     |
| 9,554,854 B2   | 1/2017 | Yates et al.                | 9,743,929 B2 | 8/2017  | Leimbach et al.     |
| 9,561,038 B2   | 2/2017 | Shelton, IV et al.          | 9,743,946 B2 | 8/2017  | Faller et al.       |
| 9,561,045 B2   | 2/2017 | Hinman et al.               | 9,743,947 B2 | 8/2017  | Price et al.        |
| 9,561,082 B2   | 2/2017 | Yen et al.                  | 9,750,499 B2 | 9/2017  | Leimbach et al.     |
| 9,561,982 B2   | 2/2017 | Enicks et al.               | 9,750,500 B2 | 9/2017  | Malkowski           |
| 9,566,708 B2   | 2/2017 | Kurnianto                   | 9,750,522 B2 | 9/2017  | Scheib et al.       |
| 9,572,592 B2   | 2/2017 | Price et al.                | 9,750,523 B2 | 9/2017  | Tsubuku             |
| 9,579,503 B2   | 2/2017 | McKinney et al.             | 9,750,563 B2 | 9/2017  | Shikhman et al.     |
| 9,585,657 B2   | 3/2017 | Shelton, IV et al.          | 9,753,135 B2 | 9/2017  | Bosch               |
| 9,592,095 B2   | 3/2017 | Panescu et al.              | 9,753,568 B2 | 9/2017  | McMillen            |
| 9,597,081 B2   | 3/2017 | Swayze et al.               | 9,757,126 B2 | 9/2017  | Cappola             |
| 9,600,031 B2   | 3/2017 | Kaneko et al.               | 9,757,128 B2 | 9/2017  | Baber et al.        |
| 9,600,138 B2   | 3/2017 | Thomas et al.               | 9,757,142 B2 | 9/2017  | Shimizu             |
| 9,603,024 B2   | 3/2017 | Wang et al.                 | 9,757,152 B2 | 9/2017  | Ogilvie et al.      |
| 9,603,277 B2   | 3/2017 | Morgan et al.               | 9,763,741 B2 | 9/2017  | Alvarez et al.      |
| D783,675 S     | 4/2017 | Yagisawa et al.             | 9,764,164 B2 | 9/2017  | Wiener et al.       |
| D784,270 S     | 4/2017 | Bhattacharya                | 9,770,541 B2 | 9/2017  | Carr et al.         |
| 9,610,114 B2   | 4/2017 | Baxter, III et al.          | 9,775,611 B2 | 10/2017 | Kostrzewski         |
| 9,622,684 B2   | 4/2017 | Wybo                        | 9,777,913 B2 | 10/2017 | Talbert et al.      |
| 9,622,808 B2   | 4/2017 | Beller et al.               | 9,782,164 B2 | 10/2017 | Mumaw et al.        |
| 9,628,501 B2   | 4/2017 | Datta Ray et al.            | 9,782,169 B2 | 10/2017 | Kimsey et al.       |
| 9,629,560 B2   | 4/2017 | Joseph                      | 9,782,212 B2 | 10/2017 | Wham et al.         |
| 9,629,623 B2   | 4/2017 | Lytle, IV et al.            | 9,782,214 B2 | 10/2017 | Houser et al.       |
| 9,629,628 B2   | 4/2017 | Aranyi                      | 9,788,835 B2 | 10/2017 | Morgan et al.       |
| 9,629,629 B2   | 4/2017 | Leimbach et al.             | 9,788,836 B2 | 10/2017 | Overmyer et al.     |
| 9,630,318 B2   | 4/2017 | Ibarz Gabardos et al.       | 9,788,851 B2 | 10/2017 | Dannaher et al.     |
| 9,636,188 B2   | 5/2017 | Gattani et al.              | 9,788,902 B2 | 10/2017 | Inoue et al.        |
| 9,636,239 B2   | 5/2017 | Durand et al.               | 9,788,907 B1 | 10/2017 | Alvi et al.         |
| 9,636,825 B2   | 5/2017 | Penn et al.                 | 9,795,436 B2 | 10/2017 | Yates et al.        |
| 9,641,596 B2   | 5/2017 | Unagami et al.              | 9,797,486 B2 | 10/2017 | Zergiebel et al.    |
| 9,641,815 B2   | 5/2017 | Richardson et al.           | 9,801,531 B2 | 10/2017 | Morita et al.       |
| 9,642,620 B2   | 5/2017 | Baxter, III et al.          | 9,801,626 B2 | 10/2017 | Parihar et al.      |
| 9,643,022 B2   | 5/2017 | Mashiach et al.             | 9,801,627 B2 | 10/2017 | Harris et al.       |
| 9,649,110 B2   | 5/2017 | Parihar et al.              | 9,801,679 B2 | 10/2017 | Trees et al.        |
| 9,649,111 B2   | 5/2017 | Shelton, IV et al.          | 9,802,033 B2 | 10/2017 | Hibner et al.       |
| 9,649,126 B2   | 5/2017 | Robertson et al.            | 9,804,618 B2 | 10/2017 | Leimbach et al.     |
| 9,649,169 B2   | 5/2017 | Cinquin et al.              | 9,805,472 B2 | 10/2017 | Chou et al.         |
| 9,652,655 B2   | 5/2017 | Satish et al.               | 9,808,244 B2 | 11/2017 | Leimbach et al.     |
| 9,655,616 B2   | 5/2017 | Aranyi                      | 9,808,245 B2 | 11/2017 | Richard et al.      |
| 9,656,092 B2   | 5/2017 | Golden                      | 9,808,246 B2 | 11/2017 | Shelton, IV et al.  |
| 9,662,116 B2   | 5/2017 | Smith et al.                | 9,808,248 B2 | 11/2017 | Hoffman             |
| 9,662,177 B2   | 5/2017 | Weir et al.                 | 9,808,249 B2 | 11/2017 | Shelton, IV         |
| 9,668,729 B2   | 6/2017 | Williams et al.             | 9,814,457 B2 | 11/2017 | Martin et al.       |
| 9,668,732 B2   | 6/2017 | Patel et al.                | 9,814,460 B2 | 11/2017 | Kimsey et al.       |
| 9,668,765 B2   | 6/2017 | Grace et al.                | 9,814,462 B2 | 11/2017 | Woodard, Jr. et al. |
| 9,671,860 B2   | 6/2017 | Ogawa et al.                | 9,814,463 B2 | 11/2017 | Williams et al.     |
| 9,675,264 B2   | 6/2017 | Acquista et al.             | 9,820,699 B2 | 11/2017 | Bingley et al.      |
| 9,675,354 B2   | 6/2017 | Weir et al.                 | 9,820,738 B2 | 11/2017 | Lytle, IV et al.    |
| 9,681,870 B2   | 6/2017 | Baxter, III et al.          | 9,820,741 B2 | 11/2017 | Kostrzewski         |
| 9,686,306 B2   | 6/2017 | Chizeck et al.              | 9,826,976 B2 | 11/2017 | Parihar et al.      |
| 9,687,230 B2   | 6/2017 | Leimbach et al.             | 9,826,977 B2 | 11/2017 | Leimbach et al.     |
| 9,690,362 B2   | 6/2017 | Leimbach et al.             | 9,827,054 B2 | 11/2017 | Richmond et al.     |
| 9,700,292 B2   | 7/2017 | Nawana et al.               | 9,827,059 B2 | 11/2017 | Robinson et al.     |
| 9,700,309 B2   | 7/2017 | Jaworek et al.              | 9,830,424 B2 | 11/2017 | Dixon et al.        |
| 9,700,312 B2   | 7/2017 | Kostrzewski et al.          | 9,833,241 B2 | 12/2017 | Huitema et al.      |
| 9,700,320 B2   | 7/2017 | Dinardo et al.              | 9,833,254 B1 | 12/2017 | Barral et al.       |
| 9,706,993 B2 * | 7/2017 | Hessler ..... A61B 17/07207 | 9,839,419 B2 | 12/2017 | Deck et al.         |
| 9,710,214 B2   | 7/2017 | Lin et al.                  | 9,839,424 B2 | 12/2017 | Zergiebel et al.    |
| 9,710,644 B2   | 7/2017 | Reybok et al.               | 9,839,428 B2 | 12/2017 | Baxter, III et al.  |
| 9,713,424 B2   | 7/2017 | Spaide                      | 9,839,470 B2 | 12/2017 | Gilbert et al.      |
| 9,713,503 B2   | 7/2017 | Goldschmidt                 | 9,839,487 B2 | 12/2017 | Dachs, II           |
| 9,717,141 B1   | 7/2017 | Tegg                        | 9,844,321 B1 | 12/2017 | Ekvall et al.       |
| 9,717,498 B2   | 8/2017 | Aranyi et al.               | 9,844,368 B2 | 12/2017 | Boudreaux et al.    |
| 9,717,525 B2   | 8/2017 | Ahluwalia et al.            | 9,844,369 B2 | 12/2017 | Huitema et al.      |
| 9,717,548 B2   | 8/2017 | Couture                     | 9,844,374 B2 | 12/2017 | Lytle, IV et al.    |
| 9,724,094 B2   | 8/2017 | Baber et al.                | 9,844,375 B2 | 12/2017 | Overmyer et al.     |
| 9,724,100 B2   | 8/2017 | Scheib et al.               | 9,844,376 B2 | 12/2017 | Baxter, III et al.  |
| 9,724,118 B2   | 8/2017 | Schulte et al.              | 9,844,379 B2 | 12/2017 | Shelton, IV et al.  |
| 9,733,663 B2   | 8/2017 | Leimbach et al.             | 9,848,058 B2 | 12/2017 | Johnson et al.      |
| 9,737,301 B2   | 8/2017 | Baber et al.                | 9,848,877 B2 | 12/2017 | Shelton, IV et al.  |
| 9,737,310 B2   | 8/2017 | Whitfield et al.            | 9,861,354 B2 | 1/2018  | Saliman et al.      |
| 9,737,335 B2   | 8/2017 | Butler et al.               | 9,861,363 B2 | 1/2018  | Chen et al.         |
|                |        |                             | 9,861,428 B2 | 1/2018  | Trees et al.        |
|                |        |                             | 9,864,839 B2 | 1/2018  | Baym et al.         |
|                |        |                             | 9,867,612 B2 | 1/2018  | Parihar et al.      |
|                |        |                             | 9,867,651 B2 | 1/2018  | Wham                |



(56)

**References Cited**

## U.S. PATENT DOCUMENTS

|               |        |                      |                 |         |                               |
|---------------|--------|----------------------|-----------------|---------|-------------------------------|
| 9,867,670 B2  | 1/2018 | Brannan et al.       | 10,022,568 B2   | 7/2018  | Messerly et al.               |
| 9,867,914 B2  | 1/2018 | Bonano et al.        | 10,028,402 B1   | 7/2018  | Walker                        |
| 9,872,609 B2  | 1/2018 | Levy                 | 10,028,744 B2   | 7/2018  | Shelton, IV et al.            |
| 9,872,683 B2  | 1/2018 | Hopkins et al.       | 10,028,761 B2   | 7/2018  | Leimbach et al.               |
| 9,877,718 B2  | 1/2018 | Weir et al.          | 10,028,788 B2   | 7/2018  | Kang                          |
| 9,877,721 B2  | 1/2018 | Schellin et al.      | 10,034,704 B2   | 7/2018  | Asher et al.                  |
| 9,883,860 B2  | 2/2018 | Leimbach             | 10,037,641 B2   | 7/2018  | Hyde et al.                   |
| 9,888,864 B2  | 2/2018 | Rondoni et al.       | 10,037,715 B2   | 7/2018  | Toly et al.                   |
| 9,888,914 B2  | 2/2018 | Martin et al.        | D826,405 S      | 8/2018  | Shelton, IV et al.            |
| 9,888,919 B2  | 2/2018 | Leimbach et al.      | 10,039,546 B2   | 8/2018  | Williams et al.               |
| 9,888,921 B2  | 2/2018 | Williams et al.      | 10,039,564 B2   | 8/2018  | Hibner et al.                 |
| 9,888,975 B2  | 2/2018 | Auld                 | 10,039,565 B2   | 8/2018  | Vezzu                         |
| 9,895,148 B2  | 2/2018 | Shelton, IV et al.   | 10,039,589 B2   | 8/2018  | Virshek et al.                |
| 9,900,787 B2  | 2/2018 | Ou                   | 10,041,822 B2   | 8/2018  | Zemlok                        |
| 9,901,342 B2  | 2/2018 | Shelton, IV et al.   | 10,044,791 B2   | 8/2018  | Kamen et al.                  |
| 9,901,406 B2  | 2/2018 | State et al.         | 10,045,704 B2   | 8/2018  | Fagin et al.                  |
| 9,905,000 B2  | 2/2018 | Chou et al.          | 10,045,776 B2   | 8/2018  | Shelton, IV et al.            |
| 9,907,196 B2  | 2/2018 | Susini et al.        | 10,045,779 B2   | 8/2018  | Savage et al.                 |
| 9,907,550 B2  | 3/2018 | Sniffin et al.       | 10,045,781 B2   | 8/2018  | Cropper et al.                |
| 9,913,642 B2  | 3/2018 | Leimbach et al.      | 10,045,782 B2   | 8/2018  | Murthy Aravalli               |
| 9,913,645 B2  | 3/2018 | Zerkle et al.        | 10,045,813 B2   | 8/2018  | Mueller                       |
| 9,918,326 B2  | 3/2018 | Gilson et al.        | 10,048,379 B2   | 8/2018  | Markendorf et al.             |
| 9,918,730 B2  | 3/2018 | Trees et al.         | 10,052,044 B2   | 8/2018  | Shelton, IV et al.            |
| 9,918,778 B2  | 3/2018 | Walberg et al.       | 10,052,102 B2   | 8/2018  | Baxter, III et al.            |
| 9,918,788 B2  | 3/2018 | Paul et al.          | 10,052,104 B2   | 8/2018  | Shelton, IV et al.            |
| 9,922,304 B2  | 3/2018 | DeBusk et al.        | 10,054,441 B2   | 8/2018  | Schorr et al.                 |
| 9,924,941 B2  | 3/2018 | Burbank              | 10,058,393 B2   | 8/2018  | Bonutti et al.                |
| 9,924,944 B2  | 3/2018 | Shelton, IV et al.   | 10,069,633 B2   | 9/2018  | Gulati et al.                 |
| 9,924,961 B2  | 3/2018 | Shelton, IV et al.   | 10,076,326 B2   | 9/2018  | Yates et al.                  |
| 9,931,040 B2  | 4/2018 | Homyk et al.         | 10,080,618 B2   | 9/2018  | Marshall et al.               |
| 9,931,118 B2  | 4/2018 | Shelton, IV et al.   | 10,084,833 B2   | 9/2018  | McDonnell et al.              |
| 9,931,124 B2  | 4/2018 | Gokharu              | D831,209 S      | 10/2018 | Huitema et al.                |
| 9,936,863 B2  | 4/2018 | Tesar                | 10,085,748 B2   | 10/2018 | Morgan et al.                 |
| 9,936,942 B2  | 4/2018 | Chin et al.          | 10,085,749 B2   | 10/2018 | Cappola et al.                |
| 9,936,955 B2  | 4/2018 | Miller et al.        | 10,092,355 B1   | 10/2018 | Hannaford et al.              |
| 9,936,961 B2  | 4/2018 | Chien et al.         | 10,095,942 B2   | 10/2018 | Mentese et al.                |
| 9,937,012 B2  | 4/2018 | Hares et al.         | 10,097,578 B2   | 10/2018 | Baldonado et al.              |
| 9,937,014 B2  | 4/2018 | Bowling et al.       | 10,098,527 B2   | 10/2018 | Weisenburgh, II et al.        |
| 9,937,626 B2  | 4/2018 | Rockrohr             | 10,098,635 B2   | 10/2018 | Burbank                       |
| 9,938,972 B2  | 4/2018 | Walley               | 10,098,642 B2   | 10/2018 | Baxter, III et al.            |
| 9,943,230 B2  | 4/2018 | Kaku et al.          | 10,098,705 B2   | 10/2018 | Brisson et al.                |
| 9,943,309 B2  | 4/2018 | Shelton, IV et al.   | 10,102,926 B1   | 10/2018 | Leonardi                      |
| 9,943,312 B2  | 4/2018 | Posada et al.        | 10,105,140 B2   | 10/2018 | Malinouskas et al.            |
| 9,943,377 B2  | 4/2018 | Yates et al.         | 10,105,142 B2   | 10/2018 | Baxter, III et al.            |
| 9,943,379 B2  | 4/2018 | Gregg, II et al.     | 10,105,470 B2   | 10/2018 | Reasoner et al.               |
| 9,943,918 B2  | 4/2018 | Grogan et al.        | 10,111,658 B2   | 10/2018 | Chowaniec et al.              |
| 9,949,785 B2  | 4/2018 | Price et al.         | 10,111,665 B2   | 10/2018 | Aranyi et al.                 |
| 9,962,157 B2  | 5/2018 | Sapre                | 10,111,679 B2   | 10/2018 | Baber et al.                  |
| 9,968,355 B2  | 5/2018 | Shelton, IV et al.   | 10,111,703 B2   | 10/2018 | Cosman, Jr. et al.            |
| 9,974,595 B2  | 5/2018 | Anderson et al.      | D834,541 S      | 11/2018 | You et al.                    |
| 9,980,140 B1  | 5/2018 | Spencer et al.       | 10,117,649 B2   | 11/2018 | Baxter et al.                 |
| 9,980,769 B2  | 5/2018 | Trees et al.         | 10,117,651 B2   | 11/2018 | Whitman et al.                |
| 9,980,778 B2  | 5/2018 | Ohline et al.        | 10,117,702 B2   | 11/2018 | Danziger et al.               |
| 9,987,000 B2  | 6/2018 | Shelton, IV et al.   | 10,118,119 B2   | 11/2018 | Sappok et al.                 |
| 9,987,068 B2  | 6/2018 | Anderson et al.      | 10,130,359 B2   | 11/2018 | Hess et al.                   |
| 9,987,072 B2  | 6/2018 | McPherson            | 10,130,360 B2   | 11/2018 | Olson et al.                  |
| 9,990,856 B2  | 6/2018 | Kuchenbecker et al.  | 10,130,361 B2   | 11/2018 | Yates et al.                  |
| 9,993,248 B2  | 6/2018 | Shelton, IV et al.   | 10,130,367 B2   | 11/2018 | Cappola et al.                |
| 9,993,258 B2  | 6/2018 | Shelton, IV et al.   | 10,133,248 B2   | 11/2018 | Fitzsimmons et al.            |
| 9,993,305 B2  | 6/2018 | Andersson            | 10,135,242 B2   | 11/2018 | Baber et al.                  |
| 10,004,491 B2 | 6/2018 | Martin et al.        | 10,136,887 B2   | 11/2018 | Shelton, IV et al.            |
| 10,004,497 B2 | 6/2018 | Overmyer et al.      | 10,136,891 B2   | 11/2018 | Shelton, IV et al.            |
| 10,004,500 B2 | 6/2018 | Shelton, IV et al.   | 10,136,949 B2   | 11/2018 | Felder et al.                 |
| 10,004,501 B2 | 6/2018 | Shelton, IV et al.   | 10,136,954 B2   | 11/2018 | Johnson et al.                |
| 10,004,527 B2 | 6/2018 | Gee et al.           | 10,137,245 B2   | 11/2018 | Melker et al.                 |
| 10,004,557 B2 | 6/2018 | Gross                | 10,143,526 B2   | 12/2018 | Walker et al.                 |
| D822,206 S    | 7/2018 | Shelton, IV et al.   | 10,143,948 B2   | 12/2018 | Bonifas et al.                |
| 10,010,322 B2 | 7/2018 | Shelton, IV et al.   | 10,147,148 B2   | 12/2018 | Wu et al.                     |
| 10,010,324 B2 | 7/2018 | Huitema et al.       | 10,149,680 B2   | 12/2018 | Parihar et al.                |
| 10,013,049 B2 | 7/2018 | Leimbach et al.      | 10,152,789 B2   | 12/2018 | Carnes et al.                 |
| 10,016,199 B2 | 7/2018 | Baber et al.         | 10,154,841 B2   | 12/2018 | Weaner et al.                 |
| 10,021,318 B2 | 7/2018 | Hugosson et al.      | 10,159,044 B2   | 12/2018 | Hrabak                        |
| 10,022,090 B2 | 7/2018 | Whitman              | 10,159,481 B2   | 12/2018 | Whitman et al.                |
| 10,022,120 B2 | 7/2018 | Martin et al.        | 10,159,483 B2   | 12/2018 | Beckman et al.                |
| 10,022,391 B2 | 7/2018 | Ruderman Chen et al. | 10,164,466 B2   | 12/2018 | Calderoni                     |
|               |        |                      | 10,166,025 B2   | 1/2019  | Leimbach et al.               |
|               |        |                      | 10,166,061 B2   | 1/2019  | Berry et al.                  |
|               |        |                      | 10,169,862 B2   | 1/2019  | Andre et al.                  |
|               |        |                      | 10,172,618 B2 * | 1/2019  | Shelton, IV ..... A61B 17/068 |



(56)

**References Cited**

## U.S. PATENT DOCUMENTS

|               |        |                    |                 |         |                                 |
|---------------|--------|--------------------|-----------------|---------|---------------------------------|
| 10,172,687 B2 | 1/2019 | Garbus et al.      | 10,292,758 B2   | 5/2019  | Boudreaux et al.                |
| 10,175,096 B2 | 1/2019 | Dickerson          | 10,292,771 B2   | 5/2019  | Wood et al.                     |
| 10,175,127 B2 | 1/2019 | Collins et al.     | 10,293,129 B2   | 5/2019  | Fox et al.                      |
| 10,178,992 B2 | 1/2019 | Wise et al.        | 10,299,792 B2   | 5/2019  | Huitema et al.                  |
| 10,179,413 B2 | 1/2019 | Rockrohr           | 10,299,870 B2   | 5/2019  | Connolly et al.                 |
| 10,180,463 B2 | 1/2019 | Beckman et al.     | 10,305,926 B2   | 5/2019  | Mihan et al.                    |
| 10,182,814 B2 | 1/2019 | Okoniewski         | D850,617 S      | 6/2019  | Shelton, IV et al.              |
| 10,182,816 B2 | 1/2019 | Shelton, IV et al. | 10,307,159 B2   | 6/2019  | Harris et al.                   |
| 10,182,818 B2 | 1/2019 | Hensel et al.      | 10,307,170 B2   | 6/2019  | Parfett et al.                  |
| 10,188,385 B2 | 1/2019 | Kerr et al.        | 10,307,199 B2   | 6/2019  | Farritor et al.                 |
| 10,189,157 B2 | 1/2019 | Schlegel et al.    | 10,311,036 B1   | 6/2019  | Hussam et al.                   |
| 10,190,888 B2 | 1/2019 | Hryb et al.        | 10,313,137 B2   | 6/2019  | Aarnio et al.                   |
| 10,194,891 B2 | 2/2019 | Jeong et al.       | 10,314,577 B2   | 6/2019  | Laurent et al.                  |
| 10,194,907 B2 | 2/2019 | Marczyk et al.     | 10,314,582 B2   | 6/2019  | Shelton, IV et al.              |
| 10,194,913 B2 | 2/2019 | Nalagatla et al.   | 10,321,907 B2   | 6/2019  | Shelton, IV et al.              |
| 10,194,972 B2 | 2/2019 | Yates et al.       | 10,321,964 B2   | 6/2019  | Grover et al.                   |
| 10,197,803 B2 | 2/2019 | Badiali et al.     | 10,327,764 B2   | 6/2019  | Harris et al.                   |
| 10,198,965 B2 | 2/2019 | Hart               | 10,335,147 B2   | 7/2019  | Rector et al.                   |
| 10,201,311 B2 | 2/2019 | Chou et al.        | 10,335,149 B2   | 7/2019  | Baxter, III et al.              |
| 10,201,349 B2 | 2/2019 | Leimbach et al.    | 10,335,180 B2   | 7/2019  | Johnson et al.                  |
| 10,201,364 B2 | 2/2019 | Leimbach et al.    | 10,335,227 B2   | 7/2019  | Heard                           |
| 10,201,365 B2 | 2/2019 | Boudreaux et al.   | 10,339,496 B2   | 7/2019  | Matson et al.                   |
| 10,205,708 B1 | 2/2019 | Fletcher et al.    | 10,342,543 B2   | 7/2019  | Shelton, IV et al.              |
| 10,206,605 B2 | 2/2019 | Shelton, IV et al. | 10,342,602 B2   | 7/2019  | Strobl et al.                   |
| 10,206,752 B2 | 2/2019 | Hares et al.       | 10,342,623 B2   | 7/2019  | Huelman et al.                  |
| 10,213,201 B2 | 2/2019 | Shelton, IV et al. | 10,343,102 B2   | 7/2019  | Reasoner et al.                 |
| 10,213,203 B2 | 2/2019 | Swayze et al.      | 10,349,824 B2   | 7/2019  | Claude et al.                   |
| 10,213,266 B2 | 2/2019 | Zemlok et al.      | 10,349,939 B2 * | 7/2019  | Shelton, IV ..... A61B 17/07207 |
| 10,213,268 B2 | 2/2019 | Dachs, II          | 10,349,941 B2   | 7/2019  | Marczyk et al.                  |
| 10,219,491 B2 | 3/2019 | Stiles, Jr. et al. | 10,350,016 B2   | 7/2019  | Burbank et al.                  |
| 10,220,522 B2 | 3/2019 | Rockrohr           | 10,357,184 B2   | 7/2019  | Crawford et al.                 |
| 10,222,750 B2 | 3/2019 | Bang et al.        | 10,357,246 B2   | 7/2019  | Shelton, IV et al.              |
| 10,226,249 B2 | 3/2019 | Jaworek et al.     | 10,357,247 B2   | 7/2019  | Shelton, IV et al.              |
| 10,226,250 B2 | 3/2019 | Beckman et al.     | 10,362,179 B2   | 7/2019  | Harris                          |
| 10,226,302 B2 | 3/2019 | Lacal et al.       | 10,363,032 B2   | 7/2019  | Scheib et al.                   |
| 10,231,634 B2 | 3/2019 | Zand et al.        | 10,363,037 B2   | 7/2019  | Aronhalt et al.                 |
| 10,231,733 B2 | 3/2019 | Ehrenfels et al.   | 10,368,861 B2   | 8/2019  | Baxter, III et al.              |
| 10,231,775 B2 | 3/2019 | Shelton, IV et al. | 10,368,865 B2   | 8/2019  | Harris et al.                   |
| 10,238,413 B2 | 3/2019 | Hibner et al.      | 10,368,867 B2   | 8/2019  | Harris et al.                   |
| 10,245,027 B2 | 4/2019 | Shelton, IV et al. | 10,368,876 B2   | 8/2019  | Bhatnagar et al.                |
| 10,245,028 B2 | 4/2019 | Shelton, IV et al. | 10,368,894 B2   | 8/2019  | Madan et al.                    |
| 10,245,029 B2 | 4/2019 | Hunter et al.      | 10,368,903 B2   | 8/2019  | Morales et al.                  |
| 10,245,030 B2 | 4/2019 | Hunter et al.      | 10,376,263 B2   | 8/2019  | Morgan et al.                   |
| 10,245,033 B2 | 4/2019 | Overmyer et al.    | 10,376,305 B2   | 8/2019  | Yates et al.                    |
| 10,245,037 B2 | 4/2019 | Conklin et al.     | 10,376,337 B2   | 8/2019  | Kilroy et al.                   |
| 10,245,038 B2 | 4/2019 | Hopkins et al.     | 10,376,338 B2   | 8/2019  | Taylor et al.                   |
| 10,251,661 B2 | 4/2019 | Collings et al.    | 10,378,893 B2   | 8/2019  | Mankovskii                      |
| 10,251,725 B2 | 4/2019 | Valentine et al.   | 10,383,518 B2   | 8/2019  | Abu-Tarif et al.                |
| 10,258,331 B2 | 4/2019 | Shelton, IV et al. | 10,383,699 B2   | 8/2019  | Kilroy et al.                   |
| 10,258,359 B2 | 4/2019 | Kapadia            | 10,384,021 B2   | 8/2019  | Koeth et al.                    |
| 10,258,362 B2 | 4/2019 | Conlon             | 10,386,990 B2   | 8/2019  | Shikhman et al.                 |
| 10,258,363 B2 | 4/2019 | Worrell et al.     | 10,390,718 B2   | 8/2019  | Chen et al.                     |
| 10,258,415 B2 | 4/2019 | Harrah et al.      | 10,390,794 B2   | 8/2019  | Kuroiwa et al.                  |
| 10,258,418 B2 | 4/2019 | Shelton, IV et al. | 10,390,825 B2   | 8/2019  | Shelton, IV et al.              |
| 10,258,425 B2 | 4/2019 | Mustufa et al.     | 10,390,831 B2   | 8/2019  | Holsten et al.                  |
| 10,263,171 B2 | 4/2019 | Wiener et al.      | 10,390,895 B2   | 8/2019  | Henderson et al.                |
| 10,265,035 B2 | 4/2019 | Fehre et al.       | 10,398,348 B2   | 9/2019  | Osadchy et al.                  |
| 10,265,068 B2 | 4/2019 | Harris et al.      | 10,398,434 B2   | 9/2019  | Shelton, IV et al.              |
| 10,265,072 B2 | 4/2019 | Shelton, IV et al. | 10,398,517 B2   | 9/2019  | Eckert et al.                   |
| 10,265,090 B2 | 4/2019 | Ingmanson et al.   | 10,398,521 B2   | 9/2019  | Itkowitz et al.                 |
| 10,265,130 B2 | 4/2019 | Hess et al.        | 10,404,521 B2   | 9/2019  | McChord et al.                  |
| 10,271,840 B2 | 4/2019 | Sapre              | 10,404,801 B2   | 9/2019  | Martch                          |
| 10,271,844 B2 | 4/2019 | Valentine et al.   | 10,405,857 B2   | 9/2019  | Shelton, IV et al.              |
| 10,271,850 B2 | 4/2019 | Williams           | 10,405,863 B2   | 9/2019  | Wise et al.                     |
| 10,271,851 B2 | 4/2019 | Shelton, IV et al. | 10,413,291 B2   | 9/2019  | Worthington et al.              |
| D847,989 S    | 5/2019 | Shelton, IV et al. | 10,413,293 B2   | 9/2019  | Shelton, IV et al.              |
| 10,278,698 B2 | 5/2019 | Racenet            | 10,413,297 B2   | 9/2019  | Harris et al.                   |
| 10,278,778 B2 | 5/2019 | State et al.       | 10,417,446 B2   | 9/2019  | Takeyama                        |
| 10,283,220 B2 | 5/2019 | Azizian et al.     | 10,420,552 B2   | 9/2019  | Shelton, IV et al.              |
| 10,285,694 B2 | 5/2019 | Viola et al.       | 10,420,558 B2   | 9/2019  | Nalagatla et al.                |
| 10,285,698 B2 | 5/2019 | Cappola et al.     | 10,420,559 B2   | 9/2019  | Marczyk et al.                  |
| 10,285,700 B2 | 5/2019 | Scheib             | 10,420,620 B2   | 9/2019  | Rockrohr                        |
| 10,285,705 B2 | 5/2019 | Shelton, IV et al. | 10,420,865 B2   | 9/2019  | Reasoner et al.                 |
| 10,292,704 B2 | 5/2019 | Harris et al.      | 10,422,727 B2   | 9/2019  | Pliskin                         |
| 10,292,707 B2 | 5/2019 | Shelton, IV et al. | 10,426,466 B2   | 10/2019 | Contini et al.                  |
|               |        |                    | 10,426,467 B2   | 10/2019 | Miller et al.                   |
|               |        |                    | 10,426,468 B2   | 10/2019 | Contini et al.                  |
|               |        |                    | 10,426,471 B2   | 10/2019 | Shelton, IV et al.              |
|               |        |                    | 10,426,481 B2   | 10/2019 | Aronhalt et al.                 |



(56)

**References Cited**

## U.S. PATENT DOCUMENTS

|               |         |                     |               |        |                    |
|---------------|---------|---------------------|---------------|--------|--------------------|
| 10,433,837 B2 | 10/2019 | Worthington et al.  | 10,568,704 B2 | 2/2020 | Savall et al.      |
| 10,433,844 B2 | 10/2019 | Shelton, IV et al.  | 10,575,868 B2 | 3/2020 | Hall et al.        |
| 10,433,849 B2 | 10/2019 | Shelton, IV et al.  | 10,582,928 B2 | 3/2020 | Hunter et al.      |
| 10,433,918 B2 | 10/2019 | Shelton, IV et al.  | 10,582,931 B2 | 3/2020 | Mujawar            |
| 10,441,279 B2 | 10/2019 | Shelton, IV et al.  | 10,582,964 B2 | 3/2020 | Weinberg et al.    |
| 10,441,345 B2 | 10/2019 | Aldridge et al.     | 10,586,074 B2 | 3/2020 | Rose et al.        |
| 10,448,948 B2 | 10/2019 | Shelton, IV et al.  | 10,588,625 B2 | 3/2020 | Weaner et al.      |
| 10,448,950 B2 | 10/2019 | Shelton, IV et al.  | 10,588,629 B2 | 3/2020 | Malinouskas et al. |
| 10,456,137 B2 | 10/2019 | Vendely et al.      | 10,588,630 B2 | 3/2020 | Shelton, IV et al. |
| 10,456,140 B2 | 10/2019 | Shelton, IV et al.  | 10,588,631 B2 | 3/2020 | Shelton, IV et al. |
| 10,456,193 B2 | 10/2019 | Yates et al.        | 10,588,632 B2 | 3/2020 | Shelton, IV et al. |
| 10,463,365 B2 | 11/2019 | Williams            | 10,588,711 B2 | 3/2020 | DiCarlo et al.     |
| 10,463,367 B2 | 11/2019 | Kostrzewski et al.  | 10,592,067 B2 | 3/2020 | Merdan et al.      |
| 10,463,371 B2 | 11/2019 | Kostrzewski         | 10,595,844 B2 | 3/2020 | Nawana et al.      |
| 10,463,436 B2 | 11/2019 | Jackson et al.      | 10,595,882 B2 | 3/2020 | Parfett et al.     |
| 10,470,762 B2 | 11/2019 | Leimbach et al.     | 10,595,887 B2 | 3/2020 | Shelton, IV et al. |
| 10,470,764 B2 | 11/2019 | Baxter, III et al.  | 10,595,930 B2 | 3/2020 | Scheib et al.      |
| 10,470,768 B2 | 11/2019 | Harris et al.       | 10,595,952 B2 | 3/2020 | Forrest et al.     |
| 10,470,791 B2 | 11/2019 | Houser              | 10,602,007 B2 | 3/2020 | Takano             |
| 10,471,254 B2 | 11/2019 | Sano et al.         | 10,602,848 B2 | 3/2020 | Magana             |
| 10,478,181 B2 | 11/2019 | Shelton, IV et al.  | 10,603,036 B2 | 3/2020 | Hunter et al.      |
| 10,478,185 B2 | 11/2019 | Nicholas            | 10,603,128 B2 | 3/2020 | Zergiebel et al.   |
| 10,478,189 B2 | 11/2019 | Bear et al.         | 10,610,223 B2 | 4/2020 | Wellman et al.     |
| 10,478,190 B2 | 11/2019 | Miller et al.       | 10,610,224 B2 | 4/2020 | Shelton, IV et al. |
| 10,478,544 B2 | 11/2019 | Friederichs et al.  | 10,610,286 B2 | 4/2020 | Wiener et al.      |
| 10,485,450 B2 | 11/2019 | Gupta et al.        | 10,610,313 B2 | 4/2020 | Bailey et al.      |
| 10,485,542 B2 | 11/2019 | Shelton, IV et al.  | 10,617,412 B2 | 4/2020 | Shelton, IV et al. |
| 10,485,543 B2 | 11/2019 | Shelton, IV et al.  | 10,617,414 B2 | 4/2020 | Shelton, IV et al. |
| 10,492,783 B2 | 12/2019 | Shelton, IV et al.  | 10,617,482 B2 | 4/2020 | Houser et al.      |
| 10,492,784 B2 | 12/2019 | Beardsley et al.    | 10,617,484 B2 | 4/2020 | Kilroy et al.      |
| 10,492,785 B2 | 12/2019 | Overmyer et al.     | 10,624,635 B2 | 4/2020 | Harris et al.      |
| 10,496,788 B2 | 12/2019 | Amarasingham et al. | 10,624,667 B2 | 4/2020 | Faller et al.      |
| 10,498,269 B2 | 12/2019 | Zemlok et al.       | 10,624,691 B2 | 4/2020 | Wiener et al.      |
| 10,499,847 B2 | 12/2019 | Latimer et al.      | 10,631,423 B2 | 4/2020 | Collins et al.     |
| 10,499,891 B2 | 12/2019 | Chaplin et al.      | 10,631,858 B2 | 4/2020 | Burbank            |
| 10,499,914 B2 | 12/2019 | Huang et al.        | 10,631,912 B2 | 4/2020 | McFarlin et al.    |
| 10,499,915 B2 | 12/2019 | Aranyi              | 10,631,916 B2 | 4/2020 | Horner et al.      |
| 10,499,994 B2 | 12/2019 | Luks et al.         | 10,631,917 B2 | 4/2020 | Ineson             |
| 10,507,068 B2 | 12/2019 | Kopp et al.         | 10,631,939 B2 | 4/2020 | Dachs, II et al.   |
| 10,512,413 B2 | 12/2019 | Schepis et al.      | 10,639,027 B2 | 5/2020 | Shelton, IV et al. |
| 10,512,461 B2 | 12/2019 | Gupta et al.        | 10,639,034 B2 | 5/2020 | Harris et al.      |
| 10,512,499 B2 | 12/2019 | McHenry et al.      | 10,639,035 B2 | 5/2020 | Shelton, IV et al. |
| 10,512,514 B2 | 12/2019 | Nowlin et al.       | 10,639,036 B2 | 5/2020 | Yates et al.       |
| 10,517,588 B2 | 12/2019 | Gupta et al.        | 10,639,037 B2 | 5/2020 | Shelton, IV et al. |
| 10,517,595 B2 | 12/2019 | Hunter et al.       | 10,639,039 B2 | 5/2020 | Vendely et al.     |
| 10,517,596 B2 | 12/2019 | Hunter et al.       | 10,639,098 B2 | 5/2020 | Cosman et al.      |
| 10,517,686 B2 | 12/2019 | Vokrot et al.       | 10,639,111 B2 | 5/2020 | Kopp               |
| 10,524,789 B2 | 1/2020  | Swayze et al.       | 10,639,185 B2 | 5/2020 | Agrawal et al.     |
| 10,531,579 B2 | 1/2020  | Hsiao et al.        | 10,653,413 B2 | 5/2020 | Worthington et al. |
| 10,531,874 B2 | 1/2020  | Morgan et al.       | 10,653,476 B2 | 5/2020 | Ross               |
| 10,531,929 B2 | 1/2020  | Widenhouse et al.   | 10,653,489 B2 | 5/2020 | Kopp               |
| 10,532,330 B2 | 1/2020  | Diallo et al.       | 10,656,720 B1 | 5/2020 | Holz               |
| 10,536,617 B2 | 1/2020  | Liang et al.        | 10,660,705 B2 | 5/2020 | Piron et al.       |
| 10,537,324 B2 | 1/2020  | Shelton, IV et al.  | 10,667,809 B2 | 6/2020 | Bakos et al.       |
| 10,537,325 B2 | 1/2020  | Bakos et al.        | 10,667,810 B2 | 6/2020 | Shelton, IV et al. |
| 10,537,351 B2 | 1/2020  | Shelton, IV et al.  | 10,667,811 B2 | 6/2020 | Harris et al.      |
| 10,542,978 B2 | 1/2020  | Chowaniec et al.    | 10,667,877 B2 | 6/2020 | Kapadia            |
| 10,542,979 B2 | 1/2020  | Shelton, IV et al.  | 10,674,897 B2 | 6/2020 | Levy               |
| 10,542,982 B2 | 1/2020  | Beckman et al.      | 10,675,021 B2 | 6/2020 | Harris et al.      |
| 10,542,991 B2 | 1/2020  | Shelton, IV et al.  | 10,675,023 B2 | 6/2020 | Cappola            |
| D876,466 S    | 2/2020  | Kobayashi et al.    | 10,675,024 B2 | 6/2020 | Shelton, IV et al. |
| 10,548,504 B2 | 2/2020  | Shelton, IV et al.  | 10,675,025 B2 | 6/2020 | Swayze et al.      |
| 10,548,612 B2 | 2/2020  | Martinez et al.     | 10,675,026 B2 | 6/2020 | Harris et al.      |
| 10,548,673 B2 | 2/2020  | Harris et al.       | 10,675,035 B2 | 6/2020 | Zingman            |
| 10,552,574 B2 | 2/2020  | Sweeney             | 10,675,100 B2 | 6/2020 | Frushour           |
| 10,555,675 B2 | 2/2020  | Satish et al.       | 10,675,104 B2 | 6/2020 | Kapadia            |
| 10,555,748 B2 | 2/2020  | Yates et al.        | 10,677,764 B2 | 6/2020 | Ross et al.        |
| 10,555,750 B2 | 2/2020  | Conlon et al.       | 10,679,758 B2 | 6/2020 | Fox et al.         |
| 10,555,769 B2 | 2/2020  | Worrell et al.      | 10,682,136 B2 | 6/2020 | Harris et al.      |
| 10,561,422 B2 | 2/2020  | Schellin et al.     | 10,682,138 B2 | 6/2020 | Shelton, IV et al. |
| 10,561,471 B2 | 2/2020  | Nichogi             | 10,686,805 B2 | 6/2020 | Reybok, Jr. et al. |
| 10,561,753 B2 | 2/2020  | Thompson et al.     | 10,687,806 B2 | 6/2020 | Shelton, IV et al. |
| 10,568,625 B2 | 2/2020  | Harris et al.       | 10,687,809 B2 | 6/2020 | Shelton, IV et al. |
| 10,568,626 B2 | 2/2020  | Shelton, IV et al.  | 10,687,810 B2 | 6/2020 | Shelton, IV et al. |
| 10,568,632 B2 | 2/2020  | Miller et al.       | 10,687,884 B2 | 6/2020 | Wiener et al.      |
|               |         |                     | 10,687,905 B2 | 6/2020 | Kostrzewski        |
|               |         |                     | 10,695,055 B2 | 6/2020 | Shelton, IV et al. |
|               |         |                     | 10,695,081 B2 | 6/2020 | Shelton, IV et al. |
|               |         |                     | 10,695,134 B2 | 6/2020 | Barral et al.      |



(56)

## References Cited

## U.S. PATENT DOCUMENTS

|               |         |                      |                 |         |                               |
|---------------|---------|----------------------|-----------------|---------|-------------------------------|
| 10,702,270 B2 | 7/2020  | Shelton, IV et al.   | 10,849,697 B2   | 12/2020 | Yates et al.                  |
| 10,702,271 B2 | 7/2020  | Aranyi et al.        | 10,849,700 B2   | 12/2020 | Kopp et al.                   |
| 10,709,446 B2 | 7/2020  | Harris et al.        | 10,856,768 B2   | 12/2020 | Osadchy et al.                |
| 10,716,489 B2 | 7/2020  | Kalvoy et al.        | 10,856,867 B2   | 12/2020 | Shelton, IV et al.            |
| 10,716,615 B2 | 7/2020  | Shelton, IV et al.   | 10,856,868 B2   | 12/2020 | Shelton, IV et al.            |
| 10,716,639 B2 | 7/2020  | Kapadia et al.       | 10,856,870 B2   | 12/2020 | Harris et al.                 |
| 10,717,194 B2 | 7/2020  | Griffiths et al.     | 10,863,984 B2 * | 12/2020 | Shelton, IV ..... A61B 17/072 |
| 10,722,222 B2 | 7/2020  | Aranyi               | 10,864,037 B2   | 12/2020 | Mun et al.                    |
| 10,722,233 B2 | 7/2020  | Wellman              | 10,864,050 B2   | 12/2020 | Tabandeh et al.               |
| 10,722,292 B2 | 7/2020  | Arya et al.          | 10,872,684 B2   | 12/2020 | McNutt et al.                 |
| D893,717 S    | 8/2020  | Messerly et al.      | 10,881,399 B2   | 1/2021  | Shelton, IV et al.            |
| 10,729,458 B2 | 8/2020  | Stoddard et al.      | 10,881,401 B2   | 1/2021  | Baber et al.                  |
| 10,729,509 B2 | 8/2020  | Shelton, IV et al.   | 10,881,446 B2   | 1/2021  | Strobl                        |
| 10,733,267 B2 | 8/2020  | Pedersen             | 10,881,464 B2   | 1/2021  | Odermatt et al.               |
| 10,736,219 B2 | 8/2020  | Seow et al.          | 10,888,321 B2   | 1/2021  | Shelton, IV et al.            |
| 10,736,616 B2 | 8/2020  | Scheib et al.        | 10,888,322 B2   | 1/2021  | Morgan et al.                 |
| 10,736,628 B2 | 8/2020  | Yates et al.         | 10,892,899 B2   | 1/2021  | Shelton, IV et al.            |
| 10,736,629 B2 | 8/2020  | Shelton, IV et al.   | 10,892,995 B2   | 1/2021  | Shelton, IV et al.            |
| 10,736,636 B2 | 8/2020  | Baxter, III et al.   | 10,893,863 B2   | 1/2021  | Shelton, IV et al.            |
| 10,736,705 B2 | 8/2020  | Scheib et al.        | 10,893,864 B2   | 1/2021  | Harris et al.                 |
| 10,743,872 B2 | 8/2020  | Leimbach et al.      | 10,893,884 B2   | 1/2021  | Stoddard et al.               |
| 10,748,115 B2 | 8/2020  | Laster et al.        | 10,898,183 B2   | 1/2021  | Shelton, IV et al.            |
| 10,751,052 B2 | 8/2020  | Stokes et al.        | 10,898,186 B2   | 1/2021  | Bakos et al.                  |
| 10,751,136 B2 | 8/2020  | Farritor et al.      | 10,898,189 B2   | 1/2021  | McDonald, II                  |
| 10,751,768 B2 | 8/2020  | Hersey et al.        | 10,898,256 B2   | 1/2021  | Yates et al.                  |
| 10,755,813 B2 | 8/2020  | Shelton, IV et al.   | 10,898,280 B2   | 1/2021  | Kopp                          |
| D896,379 S    | 9/2020  | Shelton, IV et al.   | 10,898,622 B2   | 1/2021  | Shelton, IV et al.            |
| 10,758,229 B2 | 9/2020  | Shelton, IV et al.   | 10,902,944 B1   | 1/2021  | Casey et al.                  |
| 10,758,230 B2 | 9/2020  | Shelton, IV et al.   | 10,903,685 B2   | 1/2021  | Yates et al.                  |
| 10,758,294 B2 | 9/2020  | Jones                | 10,905,415 B2   | 2/2021  | DiNardo et al.                |
| 10,758,310 B2 | 9/2020  | Shelton, IV et al.   | 10,905,418 B2   | 2/2021  | Shelton, IV et al.            |
| 10,765,376 B2 | 9/2020  | Brown, III et al.    | 10,905,420 B2   | 2/2021  | Jasemian et al.               |
| 10,765,424 B2 | 9/2020  | Baxter, III et al.   | 10,912,559 B2   | 2/2021  | Harris et al.                 |
| 10,765,427 B2 | 9/2020  | Shelton, IV et al.   | 10,912,580 B2   | 2/2021  | Green et al.                  |
| 10,765,470 B2 | 9/2020  | Yates et al.         | 10,912,619 B2   | 2/2021  | Jarc et al.                   |
| 10,772,630 B2 | 9/2020  | Wixey                | 10,918,385 B2   | 2/2021  | Overmyer et al.               |
| 10,772,651 B2 | 9/2020  | Shelton, IV et al.   | 10,930,400 B2   | 2/2021  | Robbins et al.                |
| 10,772,673 B2 | 9/2020  | Allen, IV et al.     | D914,878 S      | 3/2021  | Shelton, IV et al.            |
| 10,772,688 B2 | 9/2020  | Peine et al.         | 10,932,705 B2   | 3/2021  | Muhsin et al.                 |
| 10,779,818 B2 | 9/2020  | Zemlok et al.        | 10,932,772 B2   | 3/2021  | Shelton, IV et al.            |
| 10,779,821 B2 | 9/2020  | Harris et al.        | 10,932,784 B2   | 3/2021  | Mozdzierz et al.              |
| 10,779,823 B2 | 9/2020  | Shelton, IV et al.   | 10,932,804 B2   | 3/2021  | Scheib et al.                 |
| 10,779,897 B2 | 9/2020  | Rockrohr             | 10,932,806 B2   | 3/2021  | Shelton, IV et al.            |
| 10,779,900 B2 | 9/2020  | Pedros et al.        | 10,932,872 B2   | 3/2021  | Shelton, IV et al.            |
| 10,783,634 B2 | 9/2020  | Nye et al.           | 10,939,313 B2   | 3/2021  | Eom et al.                    |
| 10,786,298 B2 | 9/2020  | Johnson              | 10,943,454 B2   | 3/2021  | Shelton, IV et al.            |
| 10,786,317 B2 | 9/2020  | Zhou et al.          | 10,944,728 B2   | 3/2021  | Wiener et al.                 |
| 10,786,327 B2 | 9/2020  | Anderson et al.      | 10,945,727 B2   | 3/2021  | Shelton, IV et al.            |
| 10,792,038 B2 | 10/2020 | Becerra et al.       | 10,950,982 B2   | 3/2021  | Regnier et al.                |
| 10,792,118 B2 | 10/2020 | Prpa et al.          | 10,952,708 B2   | 3/2021  | Scheib et al.                 |
| 10,792,422 B2 | 10/2020 | Douglas et al.       | 10,954,935 B2   | 3/2021  | O'Shea et al.                 |
| 10,799,304 B2 | 10/2020 | Kapadia et al.       | 10,959,727 B2   | 3/2021  | Hunter et al.                 |
| 10,803,977 B2 | 10/2020 | Sanmugalingham       | 10,959,729 B2   | 3/2021  | Ehrenfels et al.              |
| 10,806,445 B2 | 10/2020 | Penna et al.         | 10,959,744 B2   | 3/2021  | Shelton, IV et al.            |
| 10,806,453 B2 | 10/2020 | Chen et al.          | 10,959,788 B2   | 3/2021  | Grover et al.                 |
| 10,806,454 B2 | 10/2020 | Kopp                 | 10,960,150 B2   | 3/2021  | Zergiebel et al.              |
| 10,806,499 B2 | 10/2020 | Castaneda et al.     | 10,966,791 B2   | 4/2021  | Harris et al.                 |
| 10,806,506 B2 | 10/2020 | Gasprede et al.      | 10,966,798 B2   | 4/2021  | Tesar et al.                  |
| 10,806,532 B2 | 10/2020 | Grubbs et al.        | 10,973,516 B2   | 4/2021  | Shelton, IV et al.            |
| 10,813,638 B2 | 10/2020 | Shelton, IV et al.   | 10,973,517 B2   | 4/2021  | Wixey                         |
| 10,813,703 B2 | 10/2020 | Swayze et al.        | 10,973,520 B2   | 4/2021  | Shelton, IV et al.            |
| 10,818,383 B2 | 10/2020 | Sharifi Sedeh et al. | 10,973,682 B2   | 4/2021  | Vezzu et al.                  |
| 10,828,028 B2 | 11/2020 | Harris et al.        | 10,980,536 B2   | 4/2021  | Weaner et al.                 |
| 10,828,030 B2 | 11/2020 | Weir et al.          | 10,980,537 B2   | 4/2021  | Shelton, IV et al.            |
| 10,835,245 B2 | 11/2020 | Swayze et al.        | 10,980,560 B2   | 4/2021  | Shelton, IV et al.            |
| 10,835,246 B2 | 11/2020 | Shelton, IV et al.   | 10,980,610 B2   | 4/2021  | Rosenberg et al.              |
| 10,835,247 B2 | 11/2020 | Shelton, IV et al.   | 10,987,102 B2   | 4/2021  | Gonzalez et al.               |
| 10,842,473 B2 | 11/2020 | Scheib et al.        | 10,987,178 B2   | 4/2021  | Shelton, IV et al.            |
| 10,842,490 B2 | 11/2020 | DiNardo et al.       | 10,992,698 B2   | 4/2021  | Patel et al.                  |
| 10,842,492 B2 | 11/2020 | Shelton, IV et al.   | 10,993,715 B2   | 5/2021  | Shelton, IV et al.            |
| 10,842,522 B2 | 11/2020 | Messerly et al.      | 10,998,098 B2   | 5/2021  | Greene et al.                 |
| 10,842,523 B2 | 11/2020 | Shelton, IV et al.   | 11,000,278 B2   | 5/2021  | Shelton, IV et al.            |
| 10,842,575 B2 | 11/2020 | Panescu et al.       | 11,007,004 B2   | 5/2021  | Shelton, IV et al.            |
| 10,842,897 B2 | 11/2020 | Schwartz et al.      | 11,007,022 B2   | 5/2021  | Shelton, IV et al.            |
| D904,612 S    | 12/2020 | Wynn et al.          | 11,013,563 B2   | 5/2021  | Shelton, IV et al.            |
|               |         |                      | 11,026,687 B2   | 6/2021  | Shelton, IV et al.            |
|               |         |                      | 11,026,712 B2   | 6/2021  | Shelton, IV et al.            |
|               |         |                      | 11,026,713 B2   | 6/2021  | Stokes et al.                 |
|               |         |                      | 11,026,751 B2   | 6/2021  | Shelton, IV et al.            |



(56)

## References Cited

## U.S. PATENT DOCUMENTS

|                 |         |                                |                 |         |                        |
|-----------------|---------|--------------------------------|-----------------|---------|------------------------|
| 11,039,834 B2   | 6/2021  | Harris et al.                  | 2005/0143759 A1 | 6/2005  | Kelly                  |
| 11,045,191 B2   | 6/2021  | Shelton, IV et al.             | 2005/0149001 A1 | 7/2005  | Uchikubo et al.        |
| 11,045,192 B2   | 6/2021  | Harris et al.                  | 2005/0149356 A1 | 7/2005  | Cyr et al.             |
| 11,045,197 B2   | 6/2021  | Shelton, IV et al.             | 2005/0165390 A1 | 7/2005  | Mauti et al.           |
| 11,045,591 B2   | 6/2021  | Shelton, IV et al.             | 2005/0192633 A1 | 9/2005  | Montpetit              |
| 11,051,817 B2   | 7/2021  | Shelton, IV et al.             | 2005/0203384 A1 | 9/2005  | Sati et al.            |
| 11,051,836 B2   | 7/2021  | Shelton, IV et al.             | 2005/0203504 A1 | 9/2005  | Wham et al.            |
| 11,051,873 B2   | 7/2021  | Wiener et al.                  | 2005/0222631 A1 | 10/2005 | Dalal et al.           |
| 11,051,876 B2   | 7/2021  | Shelton, IV et al.             | 2005/0228425 A1 | 10/2005 | Boukhny et al.         |
| 11,056,244 B2   | 7/2021  | Shelton, IV et al.             | 2005/0236474 A1 | 10/2005 | Onuma et al.           |
| 11,058,423 B2   | 7/2021  | Shelton, IV et al.             | 2005/0251233 A1 | 11/2005 | Kanzius                |
| 11,058,498 B2   | 7/2021  | Shelton, IV et al.             | 2005/0277913 A1 | 12/2005 | McCary                 |
| 11,058,501 B2   | 7/2021  | Tokarchuk et al.               | 2006/0020272 A1 | 1/2006  | Gildenberg             |
| 11,064,997 B2   | 7/2021  | Shelton, IV et al.             | 2006/0025816 A1 | 2/2006  | Shelton                |
| 11,069,012 B2   | 7/2021  | Shelton, IV et al.             | 2006/0059018 A1 | 3/2006  | Shiobara et al.        |
| 11,071,560 B2   | 7/2021  | Deck et al.                    | 2006/0079874 A1 | 4/2006  | Faller et al.          |
| 11,076,921 B2   | 8/2021  | Shelton, IV et al.             | 2006/0116908 A1 | 6/2006  | Dew et al.             |
| 11,083,458 B2   | 8/2021  | Harris et al.                  | 2006/0136622 A1 | 6/2006  | Rouvelin et al.        |
| 11,090,047 B2   | 8/2021  | Shelton, IV et al.             | 2006/0184160 A1 | 8/2006  | Ozaki et al.           |
| 11,090,048 B2   | 8/2021  | Fanelli et al.                 | 2006/0241399 A1 | 10/2006 | Fabian                 |
| 11,090,075 B2   | 8/2021  | Hunter et al.                  | 2007/0010838 A1 | 1/2007  | Shelton et al.         |
| 11,096,688 B2   | 8/2021  | Shelton, IV et al.             | 2007/0016235 A1 | 1/2007  | Tanaka et al.          |
| 11,096,693 B2   | 8/2021  | Shelton, IV et al.             | 2007/0027459 A1 | 2/2007  | Horvath et al.         |
| 11,100,631 B2   | 8/2021  | Yates et al.                   | 2007/0049947 A1 | 3/2007  | Menn et al.            |
| 11,103,268 B2   | 8/2021  | Shelton, IV et al.             | 2007/0078678 A1 | 4/2007  | DiSilvestro et al.     |
| 11,109,866 B2   | 9/2021  | Shelton, IV et al.             | 2007/0084896 A1 | 4/2007  | Doll et al.            |
| 11,109,878 B2   | 9/2021  | Shelton, IV et al.             | 2007/0167702 A1 | 7/2007  | Hasser et al.          |
| 11,114,195 B2   | 9/2021  | Shelton, IV et al.             | 2007/0168461 A1 | 7/2007  | Moore                  |
| 11,116,485 B2   | 9/2021  | Scheib et al.                  | 2007/0173803 A1 | 7/2007  | Wham et al.            |
| 11,123,070 B2   | 9/2021  | Shelton, IV et al.             | 2007/0175955 A1 | 8/2007  | Shelton et al.         |
| 11,129,611 B2   | 9/2021  | Shelton, IV et al.             | 2007/0179482 A1 | 8/2007  | Anderson               |
| 11,129,634 B2   | 9/2021  | Scheib et al.                  | 2007/0179508 A1 | 8/2007  | Arndt                  |
| 11,129,636 B2   | 9/2021  | Shelton, IV et al.             | 2007/0191713 A1 | 8/2007  | Eichmann et al.        |
| 11,129,669 B2   | 9/2021  | Stulen et al.                  | 2007/0203744 A1 | 8/2007  | Scholl                 |
| 11,129,670 B2   | 9/2021  | Shelton, IV et al.             | 2007/0225556 A1 | 9/2007  | Ortiz et al.           |
| 11,132,462 B2   | 9/2021  | Shelton, IV et al.             | 2007/0225690 A1 | 9/2007  | Sekiguchi et al.       |
| 11,134,942 B2   | 10/2021 | Harris et al.                  | 2007/0244478 A1 | 10/2007 | Bahney                 |
| 11,141,160 B2   | 10/2021 | Shelton, IV et al.             | 2007/0249990 A1 | 10/2007 | Cosmescu               |
| 11,147,607 B2   | 10/2021 | Yates et al.                   | 2007/0270660 A1 | 11/2007 | Caylor et al.          |
| 11,160,551 B2   | 11/2021 | Shelton, IV et al.             | 2007/0282195 A1 | 12/2007 | Masini et al.          |
| 11,160,605 B2   | 11/2021 | Shelton, IV et al.             | 2007/0282321 A1 | 12/2007 | Shah et al.            |
| 11,166,716 B2   | 11/2021 | Shelton, IV et al.             | 2007/0282333 A1 | 12/2007 | Fortson et al.         |
| 11,166,772 B2   | 11/2021 | Shelton, IV et al.             | 2007/0293218 A1 | 12/2007 | Meylan et al.          |
| 11,179,150 B2   | 11/2021 | Yates et al.                   | 2008/0013460 A1 | 1/2008  | Allen et al.           |
| 11,179,155 B2   | 11/2021 | Shelton, IV et al.             | 2008/0015664 A1 | 1/2008  | Podhajsky              |
| 11,179,175 B2   | 11/2021 | Houser et al.                  | 2008/0015912 A1 | 1/2008  | Rosenthal et al.       |
| 11,179,204 B2   | 11/2021 | Shelton, IV et al.             | 2008/0033404 A1 | 2/2008  | Romoda et al.          |
| 11,179,208 B2   | 11/2021 | Yates et al.                   | 2008/0040151 A1 | 2/2008  | Moore                  |
| 11,185,330 B2   | 11/2021 | Huitema et al.                 | 2008/0059658 A1 | 3/2008  | Williams               |
| 11,191,539 B2   | 12/2021 | Overmyer et al.                | 2008/0077158 A1 | 3/2008  | Haider et al.          |
| 11,191,540 B2   | 12/2021 | Aronhalt et al.                | 2008/0083414 A1 | 4/2008  | Messerges              |
| 2002/0049551 A1 | 4/2002  | Friedman et al.                | 2008/0114350 A1 | 5/2008  | Park et al.            |
| 2002/0052616 A1 | 5/2002  | Wiener et al.                  | 2008/0129465 A1 | 6/2008  | Rao                    |
| 2002/0072746 A1 | 6/2002  | Lingenfelder et al.            | 2008/0140090 A1 | 6/2008  | Aranyi et al.          |
| 2002/0138642 A1 | 9/2002  | Miyazawa et al.                | 2008/0177258 A1 | 7/2008  | Govari et al.          |
| 2003/0009111 A1 | 1/2003  | Cory et al.                    | 2008/0177362 A1 | 7/2008  | Phillips et al.        |
| 2003/0018329 A1 | 1/2003  | Hooven                         | 2008/0200940 A1 | 8/2008  | Eichmann et al.        |
| 2003/0069573 A1 | 4/2003  | Kadhiresan et al.              | 2008/0234708 A1 | 9/2008  | Houser et al.          |
| 2003/0093503 A1 | 5/2003  | Yamaki et al.                  | 2008/0255413 A1 | 10/2008 | Zemlok et al.          |
| 2003/0114851 A1 | 6/2003  | Truckai et al.                 | 2008/0262654 A1 | 10/2008 | Omori et al.           |
| 2003/0130711 A1 | 7/2003  | Pearson et al.                 | 2008/0272172 A1 | 11/2008 | Zemlok et al.          |
| 2003/0210812 A1 | 11/2003 | Khamene et al.                 | 2008/0281301 A1 | 11/2008 | DeBoer et al.          |
| 2003/0223877 A1 | 12/2003 | Anstine et al.                 | 2008/0281678 A1 | 11/2008 | Keuls et al.           |
| 2004/0078236 A1 | 4/2004  | Stoodley et al.                | 2008/0296346 A1 | 12/2008 | Shelton, IV et al.     |
| 2004/0199180 A1 | 10/2004 | Knodel et al.                  | 2008/0306759 A1 | 12/2008 | Ilkin et al.           |
| 2004/0199659 A1 | 10/2004 | Ishikawa et al.                | 2008/0312953 A1 | 12/2008 | Claus                  |
| 2004/0206365 A1 | 10/2004 | Knowlton                       | 2009/0017910 A1 | 1/2009  | Rofougaran et al.      |
| 2004/0243148 A1 | 12/2004 | Wasielowski                    | 2009/0030437 A1 | 1/2009  | Houser et al.          |
| 2004/0243435 A1 | 12/2004 | Williams                       | 2009/0036750 A1 | 2/2009  | Weinstein et al.       |
| 2005/0020909 A1 | 1/2005  | Moctezuma de la Barrera et al. | 2009/0036794 A1 | 2/2009  | Stubhaug et al.        |
| 2005/0023324 A1 | 2/2005  | Doll et al.                    | 2009/0043253 A1 | 2/2009  | Podaima                |
| 2005/0063575 A1 | 3/2005  | Ma et al.                      | 2009/0046146 A1 | 2/2009  | Hoyt                   |
| 2005/0065438 A1 | 3/2005  | Miller                         | 2009/0048589 A1 | 2/2009  | Takashino et al.       |
| 2005/0100867 A1 | 5/2005  | Hilscher et al.                | 2009/0076409 A1 | 3/2009  | Wu et al.              |
| 2005/0131390 A1 | 6/2005  | Heinrich et al.                | 2009/0090763 A1 | 4/2009  | Zemlok et al.          |
|                 |         |                                | 2009/0099866 A1 | 4/2009  | Newman                 |
|                 |         |                                | 2009/0182577 A1 | 7/2009  | Squilla et al.         |
|                 |         |                                | 2009/0206131 A1 | 8/2009  | Weisenburgh, II et al. |
|                 |         |                                | 2009/0217932 A1 | 9/2009  | Voegele                |



(56)

**References Cited**

## U.S. PATENT DOCUMENTS

|                 |         |                    |                 |         |                        |
|-----------------|---------|--------------------|-----------------|---------|------------------------|
| 2009/0234352 A1 | 9/2009  | Behnke et al.      | 2013/0046279 A1 | 2/2013  | Niklewski et al.       |
| 2009/0259149 A1 | 10/2009 | Tahara et al.      | 2013/0066647 A1 | 3/2013  | Andrie et al.          |
| 2009/0259221 A1 | 10/2009 | Tahara et al.      | 2013/0090526 A1 | 4/2013  | Suzuki et al.          |
| 2009/0299214 A1 | 12/2009 | Wu et al.          | 2013/0093829 A1 | 4/2013  | Rosenblatt et al.      |
| 2009/0307681 A1 | 12/2009 | Armado et al.      | 2013/0096597 A1 | 4/2013  | Anand et al.           |
| 2009/0326321 A1 | 12/2009 | Jacobsen et al.    | 2013/0116218 A1 | 5/2013  | Kaplan et al.          |
| 2009/0326336 A1 | 12/2009 | Lemke et al.       | 2013/0144284 A1 | 6/2013  | Behnke, II et al.      |
| 2010/0057106 A1 | 3/2010  | Sorrentino et al.  | 2013/0165776 A1 | 6/2013  | Blomqvist              |
| 2010/0065604 A1 | 3/2010  | Weng               | 2013/0178853 A1 | 7/2013  | Hyink et al.           |
| 2010/0069939 A1 | 3/2010  | Konishi            | 2013/0206813 A1 | 8/2013  | Nalagatla              |
| 2010/0069942 A1 | 3/2010  | Shelton, IV        | 2013/0214025 A1 | 8/2013  | Zemlok et al.          |
| 2010/0070417 A1 | 3/2010  | Flynn et al.       | 2013/0253480 A1 | 9/2013  | Kimball et al.         |
| 2010/0120266 A1 | 5/2010  | Rimborg            | 2013/0256373 A1 | 10/2013 | Schmid et al.          |
| 2010/0132334 A1 | 6/2010  | Duclos et al.      | 2013/0267874 A1 | 10/2013 | Marcotte et al.        |
| 2010/0137845 A1 | 6/2010  | Ramstein et al.    | 2013/0268283 A1 | 10/2013 | Vann et al.            |
| 2010/0137886 A1 | 6/2010  | Zergiebel et al.   | 2013/0277410 A1 | 10/2013 | Fernandez et al.       |
| 2010/0168561 A1 | 7/2010  | Anderson           | 2013/0317837 A1 | 11/2013 | Ballantyne et al.      |
| 2010/0179831 A1 | 7/2010  | Brown et al.       | 2013/0321425 A1 | 12/2013 | Greene et al.          |
| 2010/0191100 A1 | 7/2010  | Anderson et al.    | 2013/0325809 A1 | 12/2013 | Kim et al.             |
| 2010/0198200 A1 | 8/2010  | Horvath            | 2013/0331873 A1 | 12/2013 | Ross et al.            |
| 2010/0198248 A1 | 8/2010  | Vakharia           | 2013/0331875 A1 | 12/2013 | Ross et al.            |
| 2010/0217991 A1 | 8/2010  | Choi               | 2014/0001231 A1 | 1/2014  | Shelton, IV et al.     |
| 2010/0234996 A1 | 9/2010  | Schreiber et al.   | 2014/0001234 A1 | 1/2014  | Shelton, IV et al.     |
| 2010/0235689 A1 | 9/2010  | Tian et al.        | 2014/0005640 A1 | 1/2014  | Shelton, IV et al.     |
| 2010/0250571 A1 | 9/2010  | Pierce et al.      | 2014/0006132 A1 | 1/2014  | Barker                 |
| 2010/0258327 A1 | 10/2010 | Esenwein et al.    | 2014/0009894 A1 | 1/2014  | Yu                     |
| 2010/0292535 A1 | 11/2010 | Paskar             | 2014/0013565 A1 | 1/2014  | MacDonald et al.       |
| 2010/0292684 A1 | 11/2010 | Cybulski et al.    | 2014/0029411 A1 | 1/2014  | Nayak et al.           |
| 2011/0022032 A1 | 1/2011  | Zemlok et al.      | 2014/0033926 A1 | 2/2014  | Fassel et al.          |
| 2011/0071530 A1 | 3/2011  | Carson             | 2014/0035762 A1 | 2/2014  | Shelton, IV et al.     |
| 2011/0077512 A1 | 3/2011  | Boswell            | 2014/0066700 A1 | 3/2014  | Wilson et al.          |
| 2011/0087238 A1 | 4/2011  | Wang et al.        | 2014/0073893 A1 | 3/2014  | Bencini                |
| 2011/0105895 A1 | 5/2011  | Kornblau et al.    | 2014/0074076 A1 | 3/2014  | Gertner                |
| 2011/0118708 A1 | 5/2011  | Burbank et al.     | 2014/0081255 A1 | 3/2014  | Johnson et al.         |
| 2011/0119075 A1 | 5/2011  | Dhoble             | 2014/0081659 A1 | 3/2014  | Nawana et al.          |
| 2011/0125149 A1 | 5/2011  | El-Galley et al.   | 2014/0084949 A1 | 3/2014  | Smith et al.           |
| 2011/0152712 A1 | 6/2011  | Cao et al.         | 2014/0087999 A1 | 3/2014  | Kaplan et al.          |
| 2011/0163147 A1 | 7/2011  | Laurent et al.     | 2014/0092089 A1 | 4/2014  | Kasuya et al.          |
| 2011/0166883 A1 | 7/2011  | Palmer et al.      | 2014/0107697 A1 | 4/2014  | Patani et al.          |
| 2011/0196398 A1 | 8/2011  | Robertson et al.   | 2014/0108035 A1 | 4/2014  | Akbay et al.           |
| 2011/0237883 A1 | 9/2011  | Chun               | 2014/0108983 A1 | 4/2014  | William R et al.       |
| 2011/0251612 A1 | 10/2011 | Faller et al.      | 2014/0148729 A1 | 5/2014  | Schmitz et al.         |
| 2011/0264000 A1 | 10/2011 | Paul et al.        | 2014/0166724 A1 | 6/2014  | Schellin et al.        |
| 2011/0273465 A1 | 11/2011 | Konishi et al.     | 2014/0187856 A1 | 7/2014  | Holoien et al.         |
| 2011/0278343 A1 | 11/2011 | Knodel et al.      | 2014/0188440 A1 | 7/2014  | Donhowe et al.         |
| 2011/0290024 A1 | 12/2011 | Lefler             | 2014/0194864 A1 | 7/2014  | Martin et al.          |
| 2011/0295270 A1 | 12/2011 | Giordano et al.    | 2014/0204190 A1 | 7/2014  | Rosenblatt, III et al. |
| 2011/0306840 A1 | 12/2011 | Allen et al.       | 2014/0226572 A1 | 8/2014  | Thota et al.           |
| 2012/0022519 A1 | 1/2012  | Huang et al.       | 2014/0243799 A1 | 8/2014  | Parihar                |
| 2012/0029354 A1 | 2/2012  | Mark et al.        | 2014/0243809 A1 | 8/2014  | Gelfand et al.         |
| 2012/0046662 A1 | 2/2012  | Gilbert            | 2014/0246475 A1 | 9/2014  | Hall et al.            |
| 2012/0059684 A1 | 3/2012  | Hampapur et al.    | 2014/0249557 A1 | 9/2014  | Koch et al.            |
| 2012/0078247 A1 | 3/2012  | Worrell et al.     | 2014/0252064 A1 | 9/2014  | Mozdzierz et al.       |
| 2012/0080336 A1 | 4/2012  | Shelton, IV et al. | 2014/0263541 A1 | 9/2014  | Leimbach et al.        |
| 2012/0083786 A1 | 4/2012  | Artale et al.      | 2014/0263552 A1 | 9/2014  | Hall et al.            |
| 2012/0116265 A1 | 5/2012  | Houser et al.      | 2014/0276749 A1 | 9/2014  | Johnson                |
| 2012/0116381 A1 | 5/2012  | Houser et al.      | 2014/0303660 A1 | 10/2014 | Boyden et al.          |
| 2012/0116394 A1 | 5/2012  | Timm et al.        | 2014/0303990 A1 | 10/2014 | Schoenefeld et al.     |
| 2012/0130217 A1 | 5/2012  | Kauphusman et al.  | 2014/0364691 A1 | 12/2014 | Krivopisk et al.       |
| 2012/0145714 A1 | 6/2012  | Farascioni et al.  | 2015/0006201 A1 | 1/2015  | Pait et al.            |
| 2012/0172696 A1 | 7/2012  | Kallback et al.    | 2015/0025549 A1 | 1/2015  | Kilroy et al.          |
| 2012/0190981 A1 | 7/2012  | Harris et al.      | 2015/0032150 A1 | 1/2015  | Ishida et al.          |
| 2012/0191091 A1 | 7/2012  | Allen              | 2015/0051452 A1 | 2/2015  | Ciaccio                |
| 2012/0191162 A1 | 7/2012  | Villa              | 2015/0051617 A1 | 2/2015  | Takemura et al.        |
| 2012/0197619 A1 | 8/2012  | Namer Yelin et al. | 2015/0053737 A1 | 2/2015  | Leimbach et al.        |
| 2012/0203785 A1 | 8/2012  | Awada              | 2015/0057675 A1 | 2/2015  | Akeel et al.           |
| 2012/0211542 A1 | 8/2012  | Racenet            | 2015/0066000 A1 | 3/2015  | An et al.              |
| 2012/0245958 A1 | 9/2012  | Lawrence et al.    | 2015/0070187 A1 | 3/2015  | Wiesner et al.         |
| 2012/0253329 A1 | 10/2012 | Zemlok et al.      | 2015/0073400 A1 | 3/2015  | Sverdlik et al.        |
| 2012/0265555 A1 | 10/2012 | Cappuzzo et al.    | 2015/0108198 A1 | 4/2015  | Estrella               |
| 2012/0292367 A1 | 11/2012 | Morgan et al.      | 2015/0133945 A1 | 5/2015  | Dushyant et al.        |
| 2012/0319859 A1 | 12/2012 | Taub et al.        | 2015/0140982 A1 | 5/2015  | Postrel                |
| 2013/0008677 A1 | 1/2013  | Huifu              | 2015/0145682 A1 | 5/2015  | Harris                 |
| 2013/0024213 A1 | 1/2013  | Poon               | 2015/0148830 A1 | 5/2015  | Stulen et al.          |
| 2013/0046182 A1 | 2/2013  | Hegg et al.        | 2015/0173673 A1 | 6/2015  | Toth et al.            |
|                 |         |                    | 2015/0173756 A1 | 6/2015  | Baxter, III et al.     |
|                 |         |                    | 2015/0196295 A1 | 7/2015  | Shelton, IV et al.     |
|                 |         |                    | 2015/0199109 A1 | 7/2015  | Lee                    |
|                 |         |                    | 2015/0208934 A1 | 7/2015  | Sztrubel et al.        |



(56)

**References Cited**

## U.S. PATENT DOCUMENTS

|                 |         |                      |                   |         |                           |
|-----------------|---------|----------------------|-------------------|---------|---------------------------|
| 2015/0237502 A1 | 8/2015  | Schmidt et al.       | 2017/0172565 A1   | 6/2017  | Heneveld                  |
| 2015/0272557 A1 | 10/2015 | Overmyer et al.      | 2017/0172614 A1   | 6/2017  | Scheib et al.             |
| 2015/0272571 A1 | 10/2015 | Leimbach et al.      | 2017/0177807 A1   | 6/2017  | Fabian                    |
| 2015/0272580 A1 | 10/2015 | Leimbach et al.      | 2017/0196583 A1   | 7/2017  | Sugiyama                  |
| 2015/0272582 A1 | 10/2015 | Leimbach et al.      | 2017/0202591 A1   | 7/2017  | Shelton, IV et al.        |
| 2015/0272694 A1 | 10/2015 | Charles              | 2017/0202595 A1   | 7/2017  | Shelton, IV               |
| 2015/0297200 A1 | 10/2015 | Fitzsimmons et al.   | 2017/0202608 A1   | 7/2017  | Shelton, IV et al.        |
| 2015/0297222 A1 | 10/2015 | Huitema et al.       | 2017/0224332 A1   | 8/2017  | Hunter et al.             |
| 2015/0297228 A1 | 10/2015 | Huitema et al.       | 2017/0224334 A1   | 8/2017  | Worthington et al.        |
| 2015/0297311 A1 | 10/2015 | Tesar                | 2017/0224428 A1   | 8/2017  | Kopp                      |
| 2015/0302157 A1 | 10/2015 | Collar et al.        | 2017/0231627 A1   | 8/2017  | Shelton, IV et al.        |
| 2015/0310174 A1 | 10/2015 | Coudert et al.       | 2017/0231628 A1   | 8/2017  | Shelton, IV et al.        |
| 2015/0313538 A1 | 11/2015 | Bechtel et al.       | 2017/0245809 A1   | 8/2017  | Ma et al.                 |
| 2015/0317899 A1 | 11/2015 | Dumbauld et al.      | 2017/0249432 A1   | 8/2017  | Grantcharov               |
| 2015/0324114 A1 | 11/2015 | Hurley et al.        | 2017/0262604 A1   | 9/2017  | Francois                  |
| 2015/0328474 A1 | 11/2015 | Flyash et al.        | 2017/0265864 A1 * | 9/2017  | Hessler ..... A61B 17/072 |
| 2015/0332003 A1 | 11/2015 | Stamm et al.         | 2017/0265943 A1   | 9/2017  | Sela et al.               |
| 2015/0332196 A1 | 11/2015 | Stiller et al.       | 2017/0273715 A1   | 9/2017  | Piron et al.              |
| 2015/0335344 A1 | 11/2015 | Aljuri et al.        | 2017/0281186 A1   | 10/2017 | Shelton, IV et al.        |
| 2016/0000437 A1 | 1/2016  | Giordano et al.      | 2017/0281189 A1   | 10/2017 | Nalagatla et al.          |
| 2016/0001411 A1 | 1/2016  | Alberti              | 2017/0296173 A1   | 10/2017 | Shelton, IV et al.        |
| 2016/0015471 A1 | 1/2016  | Piron et al.         | 2017/0296185 A1   | 10/2017 | Swensgard et al.          |
| 2016/0034648 A1 | 2/2016  | Mohlenbrock et al.   | 2017/0296213 A1   | 10/2017 | Swensgard et al.          |
| 2016/0038253 A1 | 2/2016  | Piron et al.         | 2017/0303984 A1   | 10/2017 | Malackowski               |
| 2016/0066913 A1 | 3/2016  | Swayze et al.        | 2017/0304020 A1   | 10/2017 | Ng et al.                 |
| 2016/0106516 A1 | 4/2016  | Mesallum             | 2017/0312456 A1   | 11/2017 | Phillips                  |
| 2016/0106934 A1 | 4/2016  | Hiraga et al.        | 2017/0325876 A1   | 11/2017 | Nakadate et al.           |
| 2016/0121143 A1 | 5/2016  | Mumaw et al.         | 2017/0325878 A1   | 11/2017 | Messerly et al.           |
| 2016/0158468 A1 | 6/2016  | Tang et al.          | 2017/0360499 A1   | 12/2017 | Greep et al.              |
| 2016/0174998 A1 | 6/2016  | Lal et al.           | 2017/0367583 A1   | 12/2017 | Black et al.              |
| 2016/0180045 A1 | 6/2016  | Syed                 | 2017/0367754 A1   | 12/2017 | Narisawa                  |
| 2016/0184054 A1 | 6/2016  | Lowe                 | 2017/0367771 A1   | 12/2017 | Tako et al.               |
| 2016/0192960 A1 | 7/2016  | Bueno et al.         | 2017/0367772 A1   | 12/2017 | Gunn et al.               |
| 2016/0206202 A1 | 7/2016  | Frangioni            | 2017/0370710 A1   | 12/2017 | Chen et al.               |
| 2016/0224760 A1 | 8/2016  | Petak et al.         | 2018/0008359 A1   | 1/2018  | Randle                    |
| 2016/0225551 A1 | 8/2016  | Shedletsy            | 2018/0011983 A1   | 1/2018  | Zuhars et al.             |
| 2016/0228204 A1 | 8/2016  | Quaid et al.         | 2018/0042659 A1   | 2/2018  | Rupp et al.               |
| 2016/0235303 A1 | 8/2016  | Fleming et al.       | 2018/0050196 A1   | 2/2018  | Pawsey et al.             |
| 2016/0242836 A1 | 8/2016  | Eggers et al.        | 2018/0055529 A1   | 3/2018  | Messerly et al.           |
| 2016/0249910 A1 | 9/2016  | Shelton, IV et al.   | 2018/0065248 A1   | 3/2018  | Barral et al.             |
| 2016/0278841 A1 | 9/2016  | Panescu et al.       | 2018/0078170 A1   | 3/2018  | Panescu et al.            |
| 2016/0287312 A1 | 10/2016 | Tegg et al.          | 2018/0098816 A1   | 4/2018  | Govari et al.             |
| 2016/0287912 A1 | 10/2016 | Warnking             | 2018/0110523 A1   | 4/2018  | Shelton, IV               |
| 2016/0296246 A1 | 10/2016 | Schaller             | 2018/0116662 A1   | 5/2018  | Shelton, IV et al.        |
| 2016/0302210 A1 | 10/2016 | Thornton et al.      | 2018/0116735 A1   | 5/2018  | Tierney et al.            |
| 2016/0310055 A1 | 10/2016 | Zand et al.          | 2018/0122506 A1   | 5/2018  | Grantcharov et al.        |
| 2016/0314716 A1 | 10/2016 | Grubbs               | 2018/0125590 A1   | 5/2018  | Giordano et al.           |
| 2016/0314717 A1 | 10/2016 | Grubbs               | 2018/0132895 A1   | 5/2018  | Silver                    |
| 2016/0321400 A1 | 11/2016 | Durrant et al.       | 2018/0144243 A1   | 5/2018  | Hsieh et al.              |
| 2016/0323283 A1 | 11/2016 | Kang et al.          | 2018/0153574 A1   | 6/2018  | Faller et al.             |
| 2016/0331460 A1 | 11/2016 | Cheatham, III et al. | 2018/0153632 A1   | 6/2018  | Tokarchuk et al.          |
| 2016/0342753 A1 | 11/2016 | Feazell              | 2018/0154297 A1   | 6/2018  | Maletich et al.           |
| 2016/0342916 A1 | 11/2016 | Arceneaux et al.     | 2018/0161716 A1   | 6/2018  | Li et al.                 |
| 2016/0345857 A1 | 12/2016 | Jensrud et al.       | 2018/0168575 A1   | 6/2018  | Simms et al.              |
| 2016/0350490 A1 | 12/2016 | Martinez et al.      | 2018/0168577 A1   | 6/2018  | Aronhalt et al.           |
| 2016/0361070 A1 | 12/2016 | Ardel et al.         | 2018/0168579 A1   | 6/2018  | Aronhalt et al.           |
| 2016/0367305 A1 | 12/2016 | Hareland             | 2018/0168592 A1   | 6/2018  | Overmyer et al.           |
| 2016/0374723 A1 | 12/2016 | Frankhouser et al.   | 2018/0168598 A1   | 6/2018  | Shelton, IV et al.        |
| 2016/0374762 A1 | 12/2016 | Case et al.          | 2018/0168608 A1   | 6/2018  | Shelton, IV et al.        |
| 2016/0379504 A1 | 12/2016 | Bailey et al.        | 2018/0168609 A1   | 6/2018  | Fanelli et al.            |
| 2017/0027603 A1 | 2/2017  | Pandey               | 2018/0168610 A1   | 6/2018  | Shelton, IV et al.        |
| 2017/0042604 A1 | 2/2017  | McFarland et al.     | 2018/0168615 A1   | 6/2018  | Shelton, IV et al.        |
| 2017/0068792 A1 | 3/2017  | Reiner               | 2018/0168618 A1   | 6/2018  | Scott et al.              |
| 2017/0079730 A1 | 3/2017  | Azizian et al.       | 2018/0168619 A1   | 6/2018  | Scott et al.              |
| 2017/0086829 A1 | 3/2017  | Vendely et al.       | 2018/0168623 A1   | 6/2018  | Simms et al.              |
| 2017/0086930 A1 | 3/2017  | Thompson et al.      | 2018/0168625 A1   | 6/2018  | Posada et al.             |
| 2017/0105754 A1 | 4/2017  | Boudreaux et al.     | 2018/0168633 A1   | 6/2018  | Shelton, IV et al.        |
| 2017/0116873 A1 | 4/2017  | Lendvay et al.       | 2018/0168647 A1   | 6/2018  | Shelton, IV et al.        |
| 2017/0127499 A1 | 5/2017  | Unoson et al.        | 2018/0168648 A1   | 6/2018  | Shelton, IV et al.        |
| 2017/0132374 A1 | 5/2017  | Lee et al.           | 2018/0168650 A1   | 6/2018  | Shelton, IV et al.        |
| 2017/0132785 A1 | 5/2017  | Wshah et al.         | 2018/0177383 A1   | 6/2018  | Noonan et al.             |
| 2017/0143284 A1 | 5/2017  | Sehnert et al.       | 2018/0206884 A1   | 7/2018  | Beaupre                   |
| 2017/0164997 A1 | 6/2017  | Johnson et al.       | 2018/0206905 A1   | 7/2018  | Batchelor et al.          |
| 2017/0165012 A1 | 6/2017  | Chaplin et al.       | 2018/0214025 A1   | 8/2018  | Homyk et al.              |
| 2017/0172550 A1 | 6/2017  | Mukherjee et al.     | 2018/0221005 A1   | 8/2018  | Hamel et al.              |
|                 |         |                      | 2018/0221598 A1   | 8/2018  | Silver                    |
|                 |         |                      | 2018/0228557 A1   | 8/2018  | Darisse et al.            |
|                 |         |                      | 2018/0233222 A1   | 8/2018  | Daley et al.              |
|                 |         |                      | 2018/0235719 A1   | 8/2018  | Jarc                      |



(56)

**References Cited**

## U.S. PATENT DOCUMENTS

|                 |         |                         |                 |        |                    |
|-----------------|---------|-------------------------|-----------------|--------|--------------------|
| 2018/0235722 A1 | 8/2018  | Baghdadi et al.         | 2019/0200981 A1 | 7/2019 | Harris et al.      |
| 2018/0242967 A1 | 8/2018  | Meade                   | 2019/0200984 A1 | 7/2019 | Shelton, IV et al. |
| 2018/0263710 A1 | 9/2018  | Sakaguchi et al.        | 2019/0200985 A1 | 7/2019 | Shelton, IV et al. |
| 2018/0268320 A1 | 9/2018  | Shekhar                 | 2019/0200986 A1 | 7/2019 | Shelton, IV et al. |
| 2018/0271520 A1 | 9/2018  | Shelton, IV et al.      | 2019/0200987 A1 | 7/2019 | Shelton, IV et al. |
| 2018/0271603 A1 | 9/2018  | Nir et al.              | 2019/0200988 A1 | 7/2019 | Shelton, IV        |
| 2018/0289427 A1 | 10/2018 | Griffiths et al.        | 2019/0200997 A1 | 7/2019 | Shelton, IV et al. |
| 2018/0296286 A1 | 10/2018 | Peine et al.            | 2019/0201020 A1 | 7/2019 | Shelton, IV et al. |
| 2018/0303552 A1 | 10/2018 | Ryan et al.             | 2019/0201021 A1 | 7/2019 | Shelton, IV et al. |
| 2018/0304471 A1 | 10/2018 | Tokuchi                 | 2019/0201023 A1 | 7/2019 | Shelton, IV et al. |
| 2018/0310986 A1 | 11/2018 | Batchelor et al.        | 2019/0201024 A1 | 7/2019 | Shelton, IV et al. |
| 2018/0315492 A1 | 11/2018 | Bishop et al.           | 2019/0201025 A1 | 7/2019 | Shelton, IV et al. |
| 2018/0333207 A1 | 11/2018 | Moctezuma De la Barrera | 2019/0201026 A1 | 7/2019 | Shelton, IV et al. |
| 2018/0360456 A1 | 12/2018 | Shelton, IV et al.      | 2019/0201027 A1 | 7/2019 | Shelton, IV et al. |
| 2018/0368930 A1 | 12/2018 | Esterberg et al.        | 2019/0201028 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0000478 A1 | 1/2019  | Messerly et al.         | 2019/0201029 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0000569 A1 | 1/2019  | Crawford et al.         | 2019/0201030 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0001079 A1 | 1/2019  | Zergiebel et al.        | 2019/0201033 A1 | 7/2019 | Yates et al.       |
| 2019/0005641 A1 | 1/2019  | Yamamoto                | 2019/0201034 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0006047 A1 | 1/2019  | Gorek et al.            | 2019/0201036 A1 | 7/2019 | Nott et al.        |
| 2019/0025040 A1 | 1/2019  | Andreason et al.        | 2019/0201038 A1 | 7/2019 | Yates et al.       |
| 2019/0036688 A1 | 1/2019  | Wasily et al.           | 2019/0201039 A1 | 7/2019 | Widenhouse et al.  |
| 2019/0038335 A1 | 2/2019  | Mohr et al.             | 2019/0201040 A1 | 7/2019 | Messerly et al.    |
| 2019/0038364 A1 | 2/2019  | Enoki                   | 2019/0201041 A1 | 7/2019 | Kimball et al.     |
| 2019/0046198 A1 | 2/2019  | Stokes et al.           | 2019/0201042 A1 | 7/2019 | Nott et al.        |
| 2019/0053801 A1 | 2/2019  | Wixey et al.            | 2019/0201043 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0053866 A1 | 2/2019  | Seow et al.             | 2019/0201044 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0069949 A1 | 3/2019  | Vrba et al.             | 2019/0201045 A1 | 7/2019 | Yates et al.       |
| 2019/0069964 A1 | 3/2019  | Hagn                    | 2019/0201046 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0069966 A1 | 3/2019  | Petersen et al.         | 2019/0201047 A1 | 7/2019 | Yates et al.       |
| 2019/0070550 A1 | 3/2019  | Lalomia et al.          | 2019/0201073 A1 | 7/2019 | Nott et al.        |
| 2019/0070731 A1 | 3/2019  | Bowling et al.          | 2019/0201075 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0083190 A1 | 3/2019  | Graves et al.           | 2019/0201077 A1 | 7/2019 | Yates et al.       |
| 2019/0087544 A1 | 3/2019  | Peterson                | 2019/0201079 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0104919 A1 | 4/2019  | Shelton, IV et al.      | 2019/0201080 A1 | 7/2019 | Messerly et al.    |
| 2019/0110828 A1 | 4/2019  | Despatie                | 2019/0201081 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0110855 A1 | 4/2019  | Barral et al.           | 2019/0201083 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0115108 A1 | 4/2019  | Hegedus et al.          | 2019/0201085 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0125320 A1 | 5/2019  | Shelton, IV et al.      | 2019/0201086 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0125321 A1 | 5/2019  | Shelton, IV et al.      | 2019/0201087 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0125335 A1 | 5/2019  | Shelton, IV et al.      | 2019/0201090 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0125336 A1 | 5/2019  | Deck et al.             | 2019/0201091 A1 | 7/2019 | Yates et al.       |
| 2019/0125338 A1 | 5/2019  | Shelton, IV et al.      | 2019/0201092 A1 | 7/2019 | Yates et al.       |
| 2019/0125357 A1 | 5/2019  | Shelton, IV et al.      | 2019/0201102 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0125358 A1 | 5/2019  | Shelton, IV et al.      | 2019/0201104 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0125359 A1 | 5/2019  | Shelton, IV et al.      | 2019/0201112 A1 | 7/2019 | Wiener et al.      |
| 2019/0125361 A1 | 5/2019  | Shelton, IV et al.      | 2019/0201113 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0125377 A1 | 5/2019  | Shelton, IV             | 2019/0201115 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0125378 A1 | 5/2019  | Shelton, IV et al.      | 2019/0201116 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0125387 A1 | 5/2019  | Parihar et al.          | 2019/0201118 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0125388 A1 | 5/2019  | Shelton, IV et al.      | 2019/0201120 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0125430 A1 | 5/2019  | Shelton, IV et al.      | 2019/0201123 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0125431 A1 | 5/2019  | Shelton, IV et al.      | 2019/0201124 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0125432 A1 | 5/2019  | Shelton, IV et al.      | 2019/0201125 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0125454 A1 | 5/2019  | Stokes et al.           | 2019/0201126 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0125455 A1 | 5/2019  | Shelton, IV et al.      | 2019/0201127 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0125456 A1 | 5/2019  | Shelton, IV et al.      | 2019/0201128 A1 | 7/2019 | Yates et al.       |
| 2019/0125457 A1 | 5/2019  | Parihar et al.          | 2019/0201129 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0125458 A1 | 5/2019  | Shelton, IV et al.      | 2019/0201130 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0125459 A1 | 5/2019  | Shelton, IV et al.      | 2019/0201135 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0125476 A1 | 5/2019  | Shelton, IV et al.      | 2019/0201136 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0133703 A1 | 5/2019  | Seow et al.             | 2019/0201137 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0142535 A1 | 5/2019  | Seow et al.             | 2019/0201139 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0145942 A1 | 5/2019  | Dutriez et al.          | 2019/0201140 A1 | 7/2019 | Yates et al.       |
| 2019/0150975 A1 | 5/2019  | Kawasaki et al.         | 2019/0201142 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0159778 A1 | 5/2019  | Shelton, IV et al.      | 2019/0201146 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0167296 A1 | 6/2019  | Tsubuku et al.          | 2019/0201158 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0192157 A1 | 6/2019  | Scott et al.            | 2019/0201594 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0192236 A1 | 6/2019  | Shelton, IV et al.      | 2019/0204201 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0200844 A1 | 7/2019  | Shelton, IV et al.      | 2019/0205001 A1 | 7/2019 | Messerly et al.    |
| 2019/0200863 A1 | 7/2019  | Shelton, IV et al.      | 2019/0205441 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0200905 A1 | 7/2019  | Shelton, IV et al.      | 2019/0205567 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0200906 A1 | 7/2019  | Shelton, IV et al.      | 2019/0206003 A1 | 7/2019 | Harris et al.      |
| 2019/0200977 A1 | 7/2019  | Shelton, IV et al.      | 2019/0206542 A1 | 7/2019 | Shelton, IV et al. |
| 2019/0200980 A1 | 7/2019  | Shelton, IV et al.      | 2019/0206551 A1 | 7/2019 | Yates et al.       |
|                 |         |                         | 2019/0206555 A1 | 7/2019 | Morgan et al.      |
|                 |         |                         | 2019/0206556 A1 | 7/2019 | Shelton, IV et al. |
|                 |         |                         | 2019/0206561 A1 | 7/2019 | Shelton, IV et al. |
|                 |         |                         | 2019/0206562 A1 | 7/2019 | Shelton, IV et al. |



(56)

**References Cited**

## U.S. PATENT DOCUMENTS

|              |    |         |                      |              |      |         |                                 |
|--------------|----|---------|----------------------|--------------|------|---------|---------------------------------|
| 2019/0206563 | A1 | 7/2019  | Shelton, IV et al.   | 2020/0078113 | A1   | 3/2020  | Sawhney et al.                  |
| 2019/0206564 | A1 | 7/2019  | Shelton, IV et al.   | 2020/0078114 | A1   | 3/2020  | Asher et al.                    |
| 2019/0206565 | A1 | 7/2019  | Shelton, IV          | 2020/0078115 | A1   | 3/2020  | Asher et al.                    |
| 2019/0206569 | A1 | 7/2019  | Shelton, IV et al.   | 2020/0078116 | A1   | 3/2020  | Oberkircher et al.              |
| 2019/0208641 | A1 | 7/2019  | Yates et al.         | 2020/0078117 | A1   | 3/2020  | Henderson et al.                |
| 2019/0224434 | A1 | 7/2019  | Silver et al.        | 2020/0078118 | A1   | 3/2020  | Henderson et al.                |
| 2019/0254759 | A1 | 8/2019  | Azizian              | 2020/0078119 | A1   | 3/2020  | Henderson et al.                |
| 2019/0261984 | A1 | 8/2019  | Nelson et al.        | 2020/0078120 | A1   | 3/2020  | Aldridge et al.                 |
| 2019/0269476 | A1 | 9/2019  | Bowling et al.       | 2020/0081585 | A1   | 3/2020  | Petre et al.                    |
| 2019/0272917 | A1 | 9/2019  | Couture et al.       | 2020/0090808 | A1   | 3/2020  | Carroll et al.                  |
| 2019/0274662 | A1 | 9/2019  | Rockman et al.       | 2020/0100825 | A1   | 4/2020  | Henderson et al.                |
| 2019/0274705 | A1 | 9/2019  | Sawhney et al.       | 2020/0100830 | A1   | 4/2020  | Henderson et al.                |
| 2019/0274706 | A1 | 9/2019  | Nott et al.          | 2020/0106220 | A1   | 4/2020  | Henderson et al.                |
| 2019/0274707 | A1 | 9/2019  | Sawhney et al.       | 2020/0162896 | A1   | 5/2020  | Su et al.                       |
| 2019/0274708 | A1 | 9/2019  | Boudreaux            | 2020/0168323 | A1   | 5/2020  | Bullington et al.               |
| 2019/0274709 | A1 | 9/2019  | Scoggins             | 2020/0178760 | A1   | 6/2020  | Kashima et al.                  |
| 2019/0274710 | A1 | 9/2019  | Black                | 2020/0178971 | A1   | 6/2020  | Harris et al.                   |
| 2019/0274711 | A1 | 9/2019  | Scoggins et al.      | 2020/0214699 | A1 * | 7/2020  | Shelton, IV ..... A61B 17/068   |
| 2019/0274712 | A1 | 9/2019  | Faller et al.        | 2020/0222045 | A1 * | 7/2020  | Shelton, IV ..... A61B 17/07207 |
| 2019/0274713 | A1 | 9/2019  | Scoggins et al.      | 2020/0237372 | A1 * | 7/2020  | Park ..... A61B 17/072          |
| 2019/0274714 | A1 | 9/2019  | Cuti et al.          | 2020/0261075 | A1 * | 8/2020  | Boudreaux ..... A61B 17/068     |
| 2019/0274716 | A1 | 9/2019  | Nott et al.          | 2020/0261076 | A1 * | 8/2020  | Boudreaux ..... A61B 17/072     |
| 2019/0274717 | A1 | 9/2019  | Nott et al.          | 2020/0261077 | A1 * | 8/2020  | Shelton, IV ..... A61B 17/07207 |
| 2019/0274718 | A1 | 9/2019  | Denzinger et al.     | 2020/0261078 | A1 * | 8/2020  | Bakos ..... A61B 17/07207       |
| 2019/0274719 | A1 | 9/2019  | Stulen               | 2020/0261080 | A1 * | 8/2020  | Bakos ..... A61B 17/072         |
| 2019/0274720 | A1 | 9/2019  | Gee et al.           | 2020/0261081 | A1 * | 8/2020  | Boudreaux ..... A61B 17/07207   |
| 2019/0274749 | A1 | 9/2019  | Brady et al.         | 2020/0261082 | A1 * | 8/2020  | Boudreaux ..... A61B 17/072     |
| 2019/0274750 | A1 | 9/2019  | Jayme et al.         | 2020/0261083 | A1 * | 8/2020  | Bakos ..... A61B 17/072         |
| 2019/0274752 | A1 | 9/2019  | Denzinger et al.     | 2020/0261084 | A1   | 8/2020  | Bakos et al.                    |
| 2019/0278262 | A1 | 9/2019  | Taylor et al.        | 2020/0261085 | A1   | 8/2020  | Boudreaux et al.                |
| 2019/0282311 | A1 | 9/2019  | Nowlin et al.        | 2020/0261086 | A1   | 8/2020  | Zeiner et al.                   |
| 2019/0290389 | A1 | 9/2019  | Kopp                 | 2020/0261087 | A1 * | 8/2020  | Timm ..... A61B 17/072          |
| 2019/0298340 | A1 | 10/2019 | Shelton, IV et al.   | 2020/0261088 | A1   | 8/2020  | Harris et al.                   |
| 2019/0298341 | A1 | 10/2019 | Shelton, IV et al.   | 2020/0261089 | A1   | 8/2020  | Shelton, IV et al.              |
| 2019/0298342 | A1 | 10/2019 | Shelton, IV et al.   | 2020/0275928 | A1   | 9/2020  | Shelton, IV et al.              |
| 2019/0298343 | A1 | 10/2019 | Shelton, IV et al.   | 2020/0275930 | A1   | 9/2020  | Harris et al.                   |
| 2019/0298346 | A1 | 10/2019 | Shelton, IV et al.   | 2020/0281665 | A1   | 9/2020  | Kopp                            |
| 2019/0298350 | A1 | 10/2019 | Shelton, IV et al.   | 2020/0305924 | A1   | 10/2020 | Carroll                         |
| 2019/0298352 | A1 | 10/2019 | Shelton, IV et al.   | 2020/0305945 | A1   | 10/2020 | Morgan et al.                   |
| 2019/0298353 | A1 | 10/2019 | Shelton, IV et al.   | 2020/0314569 | A1   | 10/2020 | Morgan et al.                   |
| 2019/0298356 | A1 | 10/2019 | Shelton, IV et al.   | 2020/0405375 | A1   | 12/2020 | Shelton, IV et al.              |
| 2019/0298357 | A1 | 10/2019 | Shelton, IV et al.   | 2021/0007760 | A1   | 1/2021  | Reisin                          |
| 2019/0298464 | A1 | 10/2019 | Abbott               | 2021/0015568 | A1   | 1/2021  | Liao et al.                     |
| 2019/0307520 | A1 | 10/2019 | Peine et al.         | 2021/0022731 | A1   | 1/2021  | Eisinger                        |
| 2019/0311802 | A1 | 10/2019 | Kokubo et al.        | 2021/0022738 | A1   | 1/2021  | Weir et al.                     |
| 2019/0314016 | A1 | 10/2019 | Huitema et al.       | 2021/0022809 | A1   | 1/2021  | Crawford et al.                 |
| 2019/0314081 | A1 | 10/2019 | Brogna               | 2021/0059674 | A1   | 3/2021  | Shelton, IV et al.              |
| 2019/0321117 | A1 | 10/2019 | Itkowitz et al.      | 2021/0068834 | A1   | 3/2021  | Shelton, IV et al.              |
| 2019/0333626 | A1 | 10/2019 | Mansi et al.         | 2021/0128149 | A1   | 5/2021  | Whitfield et al.                |
| 2019/0343594 | A1 | 11/2019 | Garcia Kilroy et al. | 2021/0153889 | A1   | 5/2021  | Nott et al.                     |
| 2019/0374140 | A1 | 12/2019 | Tucker et al.        | 2021/0169516 | A1   | 6/2021  | Houser et al.                   |
| 2020/0000470 | A1 | 1/2020  | Du et al.            | 2021/0176179 | A1   | 6/2021  | Shelton, IV                     |
| 2020/0000509 | A1 | 1/2020  | Hayashida et al.     | 2021/0177452 | A1   | 6/2021  | Nott et al.                     |
| 2020/0038120 | A1 | 2/2020  | Ziraknejad et al.    | 2021/0177489 | A1   | 6/2021  | Yates et al.                    |
| 2020/0046353 | A1 | 2/2020  | Deck et al.          | 2021/0192914 | A1   | 6/2021  | Shelton, IV et al.              |
| 2020/0054317 | A1 | 2/2020  | Pisarnwongs et al.   | 2021/0201646 | A1   | 7/2021  | Shelton, IV et al.              |
| 2020/0054320 | A1 | 2/2020  | Harris et al.        | 2021/0205020 | A1   | 7/2021  | Shelton, IV et al.              |
| 2020/0054321 | A1 | 2/2020  | Harris et al.        | 2021/0205021 | A1   | 7/2021  | Shelton, IV et al.              |
| 2020/0054323 | A1 | 2/2020  | Harris et al.        | 2021/0205028 | A1   | 7/2021  | Shelton, IV et al.              |
| 2020/0054330 | A1 | 2/2020  | Harris et al.        | 2021/0205029 | A1   | 7/2021  | Wiener et al.                   |
| 2020/0078070 | A1 | 3/2020  | Henderson et al.     | 2021/0205030 | A1   | 7/2021  | Shelton, IV et al.              |
| 2020/0078071 | A1 | 3/2020  | Asher                | 2021/0205031 | A1   | 7/2021  | Shelton, IV et al.              |
| 2020/0078076 | A1 | 3/2020  | Henderson et al.     | 2021/0212602 | A1   | 7/2021  | Shelton, IV et al.              |
| 2020/0078077 | A1 | 3/2020  | Henderson et al.     | 2021/0212694 | A1   | 7/2021  | Shelton, IV et al.              |
| 2020/0078078 | A1 | 3/2020  | Henderson et al.     | 2021/0212717 | A1   | 7/2021  | Yates et al.                    |
| 2020/0078079 | A1 | 3/2020  | Morgan et al.        | 2021/0212719 | A1   | 7/2021  | Houser et al.                   |
| 2020/0078080 | A1 | 3/2020  | Henderson et al.     | 2021/0212770 | A1   | 7/2021  | Messerly et al.                 |
| 2020/0078081 | A1 | 3/2020  | Jayme et al.         | 2021/0212771 | A1   | 7/2021  | Shelton, IV et al.              |
| 2020/0078082 | A1 | 3/2020  | Henderson et al.     | 2021/0212774 | A1   | 7/2021  | Shelton, IV et al.              |
| 2020/0078089 | A1 | 3/2020  | Henderson et al.     | 2021/0212775 | A1   | 7/2021  | Shelton, IV et al.              |
| 2020/0078096 | A1 | 3/2020  | Barbagli et al.      | 2021/0212782 | A1   | 7/2021  | Shelton, IV et al.              |
| 2020/0078106 | A1 | 3/2020  | Henderson et al.     | 2021/0219976 | A1   | 7/2021  | DiNardo et al.                  |
| 2020/0078110 | A1 | 3/2020  | Henderson et al.     | 2021/0220058 | A1   | 7/2021  | Messerly et al.                 |
| 2020/0078111 | A1 | 3/2020  | Oberkircher et al.   | 2021/0240852 | A1   | 8/2021  | Shelton, IV et al.              |
| 2020/0078112 | A1 | 3/2020  | Henderson et al.     | 2021/0241898 | A1   | 8/2021  | Shelton, IV et al.              |
|              |    |         |                      | 2021/0249125 | A1   | 8/2021  | Morgan et al.                   |
|              |    |         |                      | 2021/0251487 | A1   | 8/2021  | Shelton, IV et al.              |
|              |    |         |                      | 2021/0259697 | A1   | 8/2021  | Shelton, IV et al.              |
|              |    |         |                      | 2021/0259698 | A1   | 8/2021  | Shelton, IV et al.              |



(56)

**References Cited**

## U.S. PATENT DOCUMENTS

2021/0282780 A1 9/2021 Shelton, IV et al.  
 2021/0282781 A1 9/2021 Shelton, IV et al.  
 2021/0315579 A1 10/2021 Shelton, IV et al.  
 2021/0315580 A1 10/2021 Shelton, IV et al.  
 2021/0315581 A1 10/2021 Shelton, IV et al.  
 2021/0315582 A1 10/2021 Shelton, IV et al.  
 2021/0322014 A1 10/2021 Shelton, IV et al.  
 2021/0322015 A1 10/2021 Shelton, IV et al.  
 2021/0322017 A1 10/2021 Shelton, IV et al.  
 2021/0322018 A1 10/2021 Shelton, IV et al.  
 2021/0322019 A1 10/2021 Shelton, IV et al.  
 2021/0322020 A1 10/2021 Shelton, IV et al.  
 2021/0336939 A1 10/2021 Wiener et al.

## FOREIGN PATENT DOCUMENTS

CN 101617950 A 1/2010  
 CN 104490448 B 3/2017  
 CN 206097107 U 4/2017  
 CN 108652695 A 10/2018  
 DE 3016131 A1 10/1981  
 DE 3824913 A1 2/1990  
 DE 4002843 C1 4/1991  
 DE 102005051367 A1 4/2007  
 DE 102016207666 A1 11/2017  
 EP 0000756 B1 10/1981  
 EP 0408160 A1 1/1991  
 EP 0473987 A1 3/1992  
 EP 0929263 B1 7/1999  
 EP 1214913 A2 6/2002  
 EP 2732772 A1 5/2014  
 EP 2942023 A2 11/2015  
 EP 3047806 A1 7/2016  
 EP 3056923 A1 8/2016  
 EP 3095399 A2 11/2016  
 EP 3120781 A2 1/2017  
 EP 3135225 A2 3/2017  
 EP 3141181 A1 3/2017  
 FR 2838234 A1 10/2003  
 GB 2037167 A1 7/1980  
 GB 2509523 A 7/2014  
 JP 55373315 A 6/1978  
 JP 2001029353 A 2/2001  
 JP 2007123394 A 5/2007  
 JP 2017513561 A 6/2017  
 KR 20140104587 A 8/2014  
 KR 101587721 B1 1/2016  
 WO WO-9734533 A1 9/1997  
 WO WO-0024322 A1 5/2000  
 WO WO-0108578 A1 2/2001  
 WO WO-0112089 A1 2/2001  
 WO WO-0120892 A2 3/2001  
 WO WO-03079909 A2 10/2003  
 WO WO-2007137304 A2 11/2007  
 WO WO-2008053485 A1 5/2008  
 WO WO-2008056618 A2 5/2008  
 WO WO-2008069816 A1 6/2008  
 WO WO-2008147555 A2 12/2008  
 WO WO-2011112931 A1 9/2011  
 WO WO-2013143573 A1 10/2013  
 WO WO-2014031800 A1 2/2014  
 WO WO-2014071184 A1 5/2014  
 WO WO-2014134196 A1 9/2014  
 WO WO-2015129395 A1 9/2015  
 WO WO-2016100719 A1 6/2016  
 WO WO-2016118752 A1 7/2016  
 WO WO-2016206015 A1 12/2016  
 WO WO-2017011382 A1 1/2017  
 WO WO-2017011646 A1 1/2017  
 WO WO-2017058617 4/2017  
 WO WO-2017058695 A1 4/2017  
 WO WO-2017151996 A1 9/2017  
 WO WO-2017189317 A1 11/2017  
 WO WO-2017205308 A1 11/2017  
 WO WO-2017210499 A1 12/2017

WO WO-2017210501 A1 12/2017  
 WO WO-2018116247 A1 6/2018  
 WO WO-2018152141 A1 8/2018  
 WO WO-2018176414 A1 10/2018

## OTHER PUBLICATIONS

“ATM-MPLS Network Interworking Version 2.0, of-aic-0178.001” ATM Standard, The ATM Forum Technical Committee, published Aug. 2003.

“Surgical instrumentation: the true cost of instrument trays and a potential strategy for optimization”; Mhlaba et al.; Sep. 23, 2015 (Year: 2015).

Allan et al., “3-D Pose Estimation of Articulated Instruments in Robotic Minimally Invasive Surgery,” IEEE Transactions on Medical Imaging, vol. 37, No. 5, May 1, 2018, pp. 1204-1213.

Altenberg et al., “Genes of Glycolysis are Ubiquitously Overexpressed in 24 Cancer Classes,” Genomics, vol. 84, pp. 1014-1020 (2004).

Anonymous, “Internet of Things Powers Connected Surgical Device Infrastructure Case Study”, Dec. 31, 2016 (Dec. 31, 2016), Retrieved from the Internet: URL: [https://www.cognizant.com/services-resources/150110\\_IoT\\_connected\\_surgical\\_devices.pdf](https://www.cognizant.com/services-resources/150110_IoT_connected_surgical_devices.pdf).

Benkmann et al., “Concept of iterative optimization of minimally invasive surgery,” 2017 22nd International Conference on Methods and Models in Automation and Robotics (MMAR), IEEE pp. 443-446, Aug. 28, 2017.

Bonaci et al., “To Make a Robot Secure: An Experimental Analysis of Cyber Security Threats Against Teleoperated Surgical Robots,” May 13, 2015. Retrieved from the Internet: URL: <https://arxiv.org/pdf/1504.04339v2.pdf> [retrieved on Aug. 24, 2019].

Cengiz, et al., “A Tale of Two Compartments: Interstitial Versus Blood Glucose Monitoring,” Article, Jun. 2009, pp. S11-S16, vol. 11, Supplement 1, Diabetes Technology & Therapeutics.

Choi et al., A haptic augmented reality surgeon console for a laparoscopic surgery robot system, 2013, IEEE, p. 355-357 (Year: 2013).

CRC Press, “The Measurement, Instrumentation and Sensors Handbook,” 1999, Section VII, Chapter 41, Peter O’Shea, “Phase Measurement,” pp. 1303-1321, ISBN 0/8493-2145-X.

Dottorato, “Analysis and Design of the Rectangular Microstrip Patch Antennas for TM<sub>0n0</sub> operating mode,” Article, Oct. 8, 2010, pp. 1-9, Microwave Journal.

Draijer, Matthijs et al., “Review of laser speckle contrast techniques for visualizing tissue perfusion,” Lasers in Medical Science, Springer-Verlag, LO, vol. 24, No. 4, Dec. 3, 2008, pp. 639-651.

Engel et al. “A safe robot system for craniofacial surgery”, 2013 IEEE International Conference on Robotics and Automation (ICRA); May 6-10, 2013; Karlsruhe, Germany, vol. 2, Jan. 1, 2001, pp. 2020-2024.

Flores et al., “Large-scale Offloading in the Internet of Things,” 2017 IEEE International Conference on Pervasive Computing and Communications Workshops (PERCOM Workshops), IEEE, pp. 479-484, Mar. 13, 2017.

Giannios, et al., “Visible to near-infrared refractive properties of freshly-excised human-liver tissues: marking hepatic malignancies,” Article, Jun. 14, 2016, pp. 1-10, Scientific Reports 6, Article No. 27910, Nature.

Harold I. Brandon and V. Leroy Young, Mar. 1997, Surgical Services Management vol. 3 No. 3. retrieved from the internet <<https://www.surgimedics.com/Research%20Articles/Electrosurgical%20Plume/Characterization%20And%20Removal%20Of%20Electrosurgical%20Smoke.pdf>> (Year: 1997).

Hirayama et al., “Quantitative Metabolome Profiling of Colon and Stomach Cancer Microenvironment by Capillary Electrophoresis Time-of-Flight Mass Spectrometry,” Article, Jun. 2009, pp. 4918-4925, vol. 69, Issue 11, Cancer Research.

Homa Alemzadeh et al., “Targeted Attacks on Teleoperated Surgical Robots: Dynamic Model-Based Detection and Mitigation,” 2016 46th Annual IEEE/IFIP International Conference on Dependable Systems and Networks (DSN), IEEE, Jun. 28, 2016, pp. 395-406.



(56)

**References Cited**

## OTHER PUBLICATIONS

Horn et al., "Effective data validation of high-frequency data: Time-point-time-interval-, and trend-based methods," *Computers in Biology and Medic*, New York, NY, vol. 27, No. 5, pp. 389-409 (1997).

Hsiao-Wei Tang, "ARCM", Video, Sep. 2012, YouTube, 5 screenshots, Retrieved from internet: <<https://www.youtube.com/watch?v=UldQaxb3fRw&feature=youtu.be>>.

IEEE Std 802.3-2012 (Revision of IEEE Std 802.3-2008, published Dec. 28, 2012).

IEEE Std No. 177, "Standard Definitions and Methods of Measurement for Piezoelectric Vibrators," published May 1966, The Institute of Electrical and Electronics Engineers, Inc., New York, N.Y.

Jiang, "'Sound of Silence': a secure indoor wireless ultrasonic communication system," Article, 2014, pp. 46-50, Snapshots of Doctoral Research at University College Cork, School of Engineering—Electrical & Electronic Engineering, UCC, Cork, Ireland.

Kalantarian et al., "Computation Offloading for Real-Time Health-Monitoring Devices," 2016 38th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EBMC), IEEE, pp. 4971-4974, Aug. 16, 2016.

Kassahun et al., "Surgical Robotics Beyond Enhanced Dexterity Instrumentation: A Survey of the Machine Learning Techniques and their Role in Intelligent and Autonomous Surgical Actions," *International Journal of Computer Assisted Radiology and Surgery*, vol. 11, No. 4, Oct. 8, 2015, pp. 553-568.

Khazaei et al., "Health Informatics for Neonatal Intensive Care Units: An Analytical Modeling Perspective," *IEEE Journal of Translational Engineering in Health and Medicine*, vol. 3, pp. 1-9, Oct. 21, 2015.

Li, et al., "Short-range ultrasonic communications in air using quadrature modulation," *Journal*, Oct. 30, 2009, pp. 2060-2072, *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control*, vol. 56, No. 10, IEEE.

Marshall Brain, How Microcontrollers Work, 2006, retrieved from the internet <<https://web.archive.org/web/20060221235221/http://electronics.howstuffworks.com/microcontroller.htm/printable>> (Year: 2006).

Miksch et al., "Utilizing temporal data abstraction for data validation and therapy planning for artificially ventilated newborn infants," *Artificial Intelligence in Medicine*, vol. 8, No. 6, pp. 543-576 (1996).

Miller, et al., "Impact of Powered and Tissue-Specific Endoscopic Stapling Technology on Clinical and Economic Outcomes of Video-Assisted Thoracic Surgery Lobectomy Procedures: A Retrospective, Observational Study," Article, Apr. 2018, pp. 707-723, vol. 35 (Issue 5), *Advances in Therapy*.

Misawa, et al. "Artificial Intelligence-Assisted Polyp Detection for Colonoscopy: Initial Experience," Article, Jun. 2018, pp. 2027-2029, vol. 154, Issue 8, *American Gastroenterology Association*.

Nabil Simaan et al., "Intelligent Surgical Robots with Situational Awareness: From Good to Great Surgeons", DOI: 10.1115/1.2015-Sep-6 external link, Sep. 2015 (Sep. 2015), p. 3-6, Retrieved from the Internet: URL:<http://memagazineselect.asmedigitalcollection.asme.org/data/journals/meena/936888/me-2015-sep6.pdf> XP055530863.

Salamon, "AI Detects Polyps Better Than Colonoscopists" Online Article, Jun. 3, 2018, *Medscape Medical News*, Digestive Disease Week (DDW) 2018: Presentation 133.

Shen, et al., "An iridium nanoparticles dispersed carbon based thick film electrochemical biosensor and its application for a single use, disposable glucose biosensor," Article, Feb. 3, 2007, pp. 106-113, vol. 125, Issue 1, *Sensors and Actuators B: Chemical*, Science Direct.

Shi et al., an intuitive control console for robotic surgery system, 2014, IEEE, p. 404-407 (Year: 2014).

Sorrells, P., "Application Note AN680. Passive RFID Basics," retrieved from <http://ww1.microchip.com/downloads/en/AppNotes/00680b.pdf> on Feb. 26, 2020, Dec. 31, 1998, pp. 1-7.

Stacey et al., "Temporal abstraction in intelligent clinical data analysis: A survey," *Artificial Intelligence in Medicine*, vol. 39, No. 1, pp. 1-24 (2006).

Staub et al., "Contour-based Surgical Instrument Tracking Supported by Kinematic Prediction," *Proceedings of the 2010 3rd IEEE RAS & EMBS International Conference on Biomedical Robotics and Biomechanics*, Sep. 1, 2010, pp. 746-752.

Sun et al., Innovative effector design for simulation training in robotic surgery, 2010, IEEE, p. 1755-1759 (Year: 2010).

Takahashi et al., "Automatic smoke evacuation in laparoscopic surgery: a simplified method for objective evaluation," *Surgical Endoscopy*, vol. 27, No. 8, pp. 2980-2987, Feb. 23, 2013.

Trautman, Peter, "Breaking the Human-Robot Deadlock: Surpassing Shared Control Performance Limits with Sparse Human-Robot Interaction," *Robotics: Science and Systems XIII*, pp. 1-10, Jul. 12, 2017.

Vander Heiden, et al., "Understanding the Warburg effect: the metabolic requirements of cell proliferation," Article, 22 May 2009, pp. 1-12, vol. 324, Issue 5930, *Science*.

Weede et al. "An Intelligent and Autonomous Endoscopic Guidance System for Minimally Invasive Surgery," 2013 IEEE International Conference on Robotics and Automation (ICRA), May 6-10, 2013. Karlsruhe, Germany, May 1, 2011, pp. 5762-5768.

Xie et al., Development of stereo vision and master-slave controller for a compact surgical robot system, 2015, IEEE, p. 403-407 (Year: 2015).

Yang et al., "A dynamic strategy for packet scheduling and bandwidth allocation based on channel quality in IEEE 802.16e OFDMA system," *Journal of Network and Computer Applications*, vol. 39, pp. 52-60, May 2, 2013.

Yuyi Mao et al., "A Survey on Mobile Edge Computing: the Communication Perspective," *IEEE Communications Surveys & Tutorials*, pp. 2322-2358, Jun. 13, 2017.

Zoccali, Bruno, "A Method for Approximating Component Temperatures at Altitude Conditions Based on CFD Analysis at Sea Level Conditions," (white paper), [www.tdmginc.com](http://www.tdmginc.com), Dec. 6, 2018 (9 pages).

Anonymous: "Screwdriver—Wikipedia", [en.wikipedia.org](http://en.wikipedia.org), Jun. 23, 2019, XP055725151, Retrieved from the Internet: URL:<https://en.wikipedia.org/w/index.php?title=Screwdriver&oldid=903111203> [retrieved on Mar. 20, 2021].

Anonymous: "Titanium Key Chain Tool 1.1, Ultralight Multipurpose Key Chain Tool, Forward Cutting Can Opener—Vargo Titanium," [vargooutdoors.com](http://vargooutdoors.com), Jul. 5, 2014 (Jul. 5, 2014), retrieved from the internet: <https://vargooutdoors.com/titanium-key-chain-tool-1-1.html>.

Screen captures from YouTube video clip entitled "Four ways to use the Lego Brick Separator Tool," 2 pages, uploaded on May 29, 2014 by user "Sarah Lewis". Retrieved from internet: <https://www.youtube.com/watch?v=ucKiRD6U1LU> (Year: 2014).

Nordlinger, Christopher, "The Internet of Things and the Operating Room of the Future," May 4, 2015, <https://medium.com/@chrisondinger/the-internet-of-things-and-the-operating-room-of-the-future-8999a143d7b1>, retrieved from the internet on Apr. 27, 2021, 9 pages.

Phumzile Malindi, "5. QoS in Telemedicine," "Telemedicine," Jun. 20, 2011, *IntechOpen*, pp. 119-138.

Roy D Cullum, "Handbook of Engineering Design", ISBN: 9780408005586, Jan. 1, 1988 (Jan. 1, 1988), XP055578597, ISBN: 9780408005586, 10-20, Chapter 6, p. 138, right-hand column, paragraph 3.

\* cited by examiner



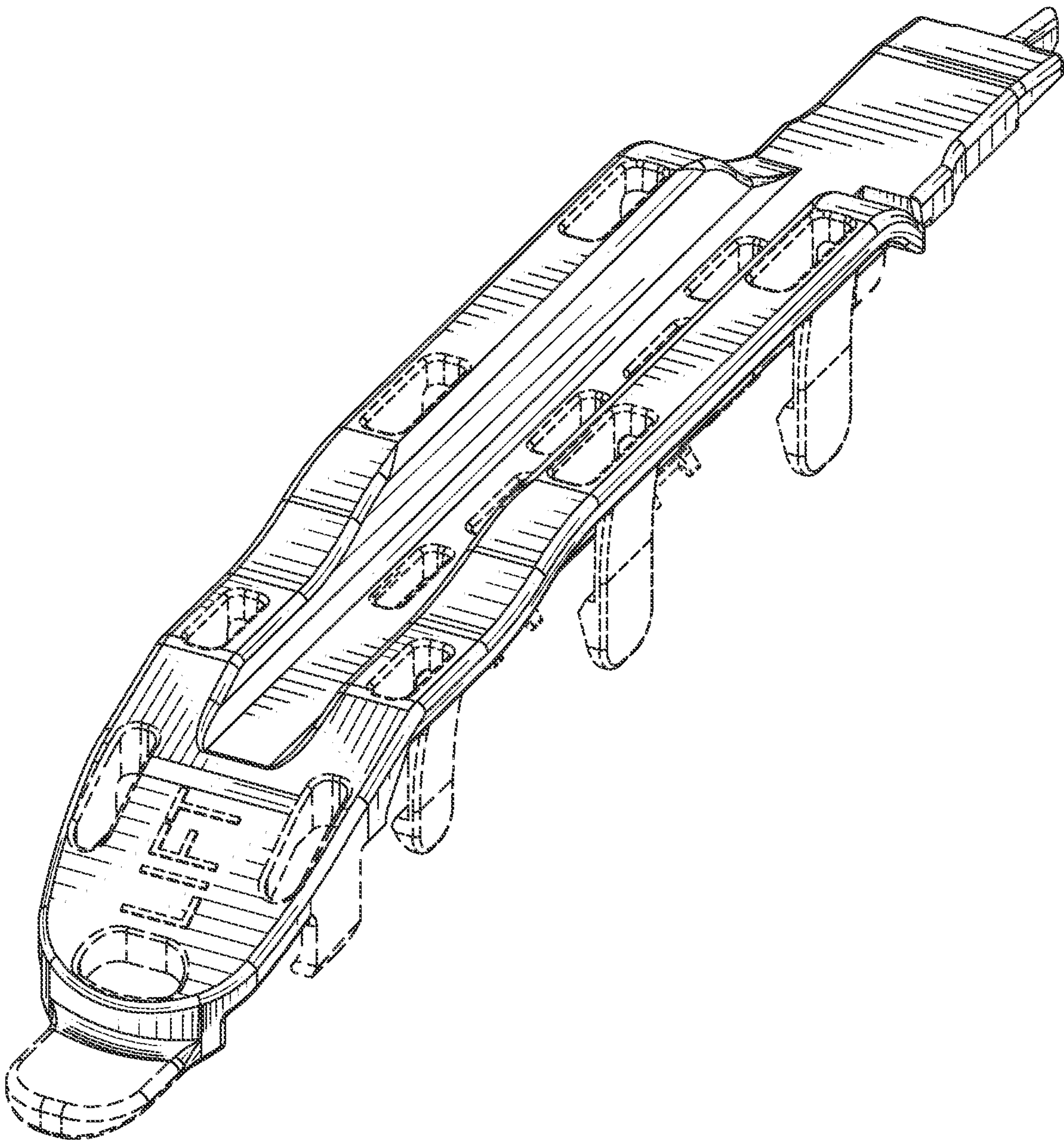


FIG. 1



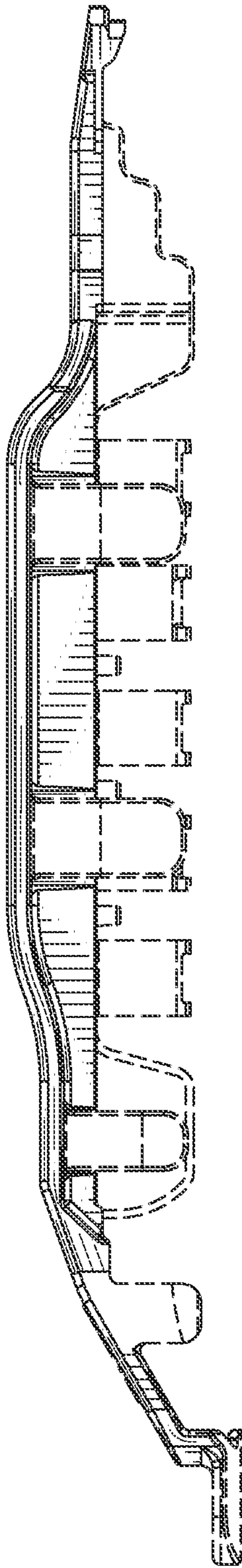


FIG. 2



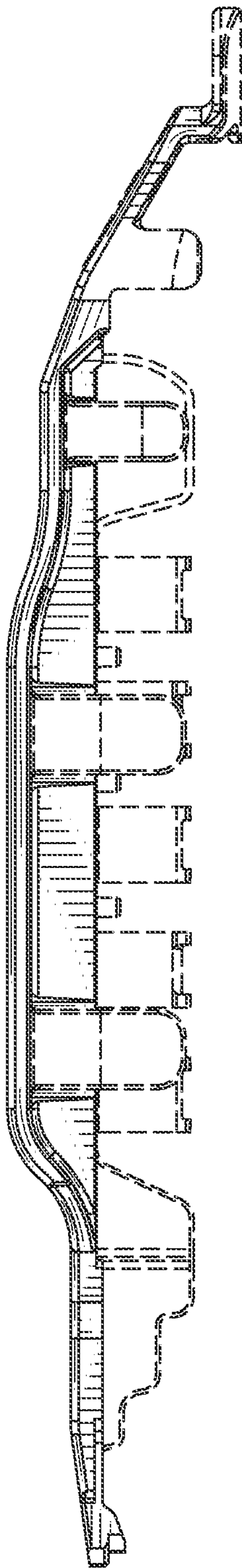


FIG. 3



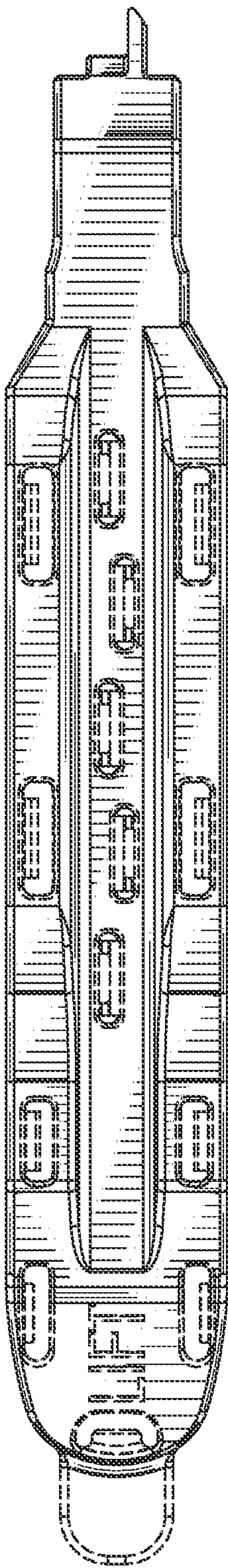


FIG. 4

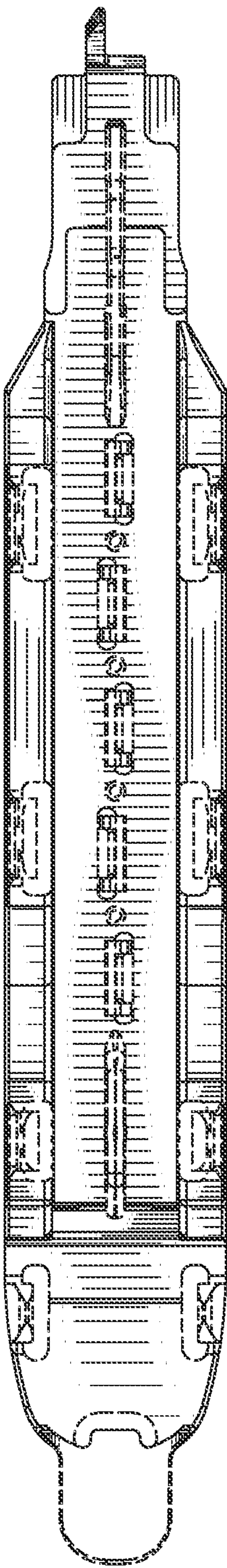


FIG. 5



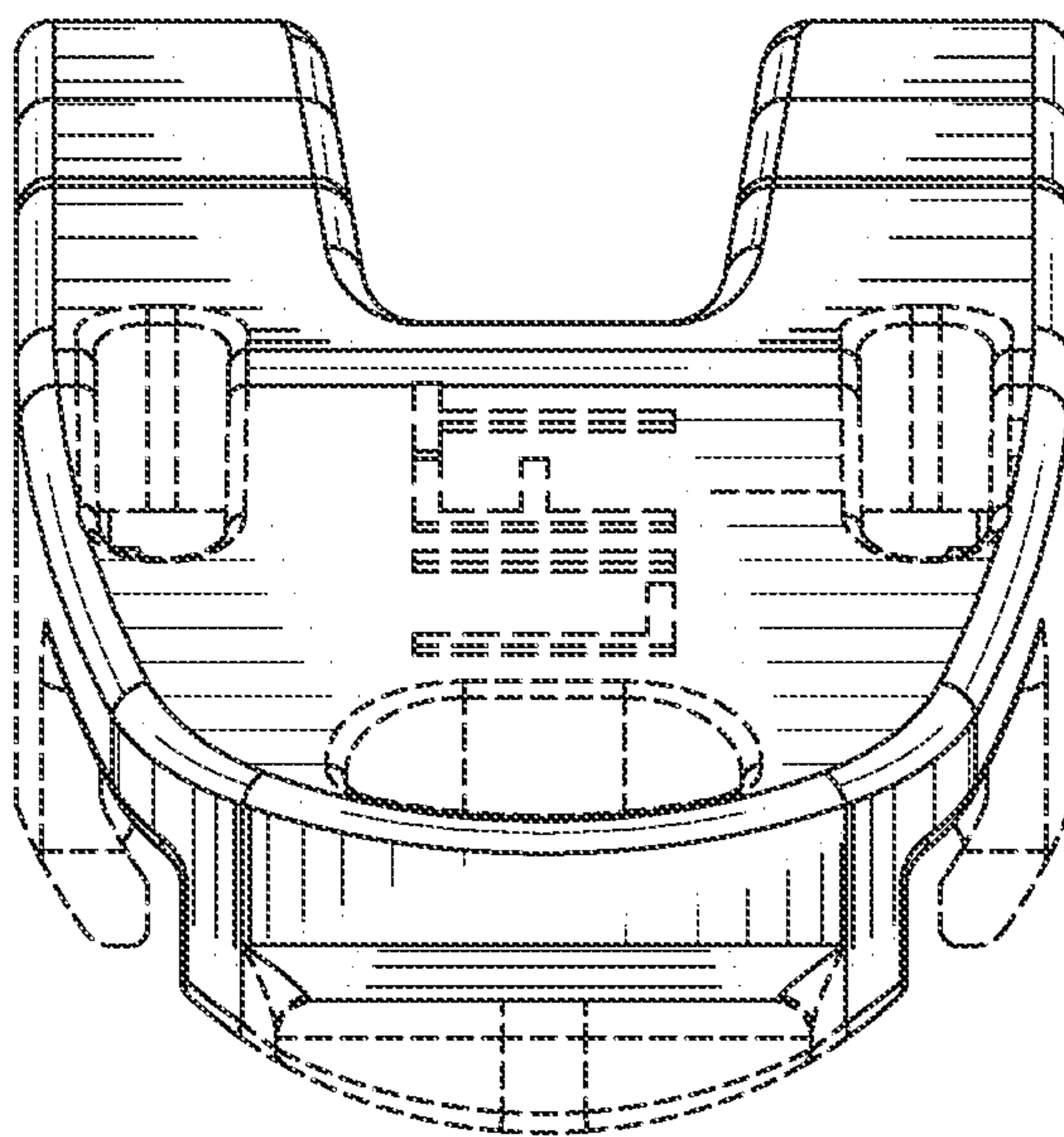


FIG. 6

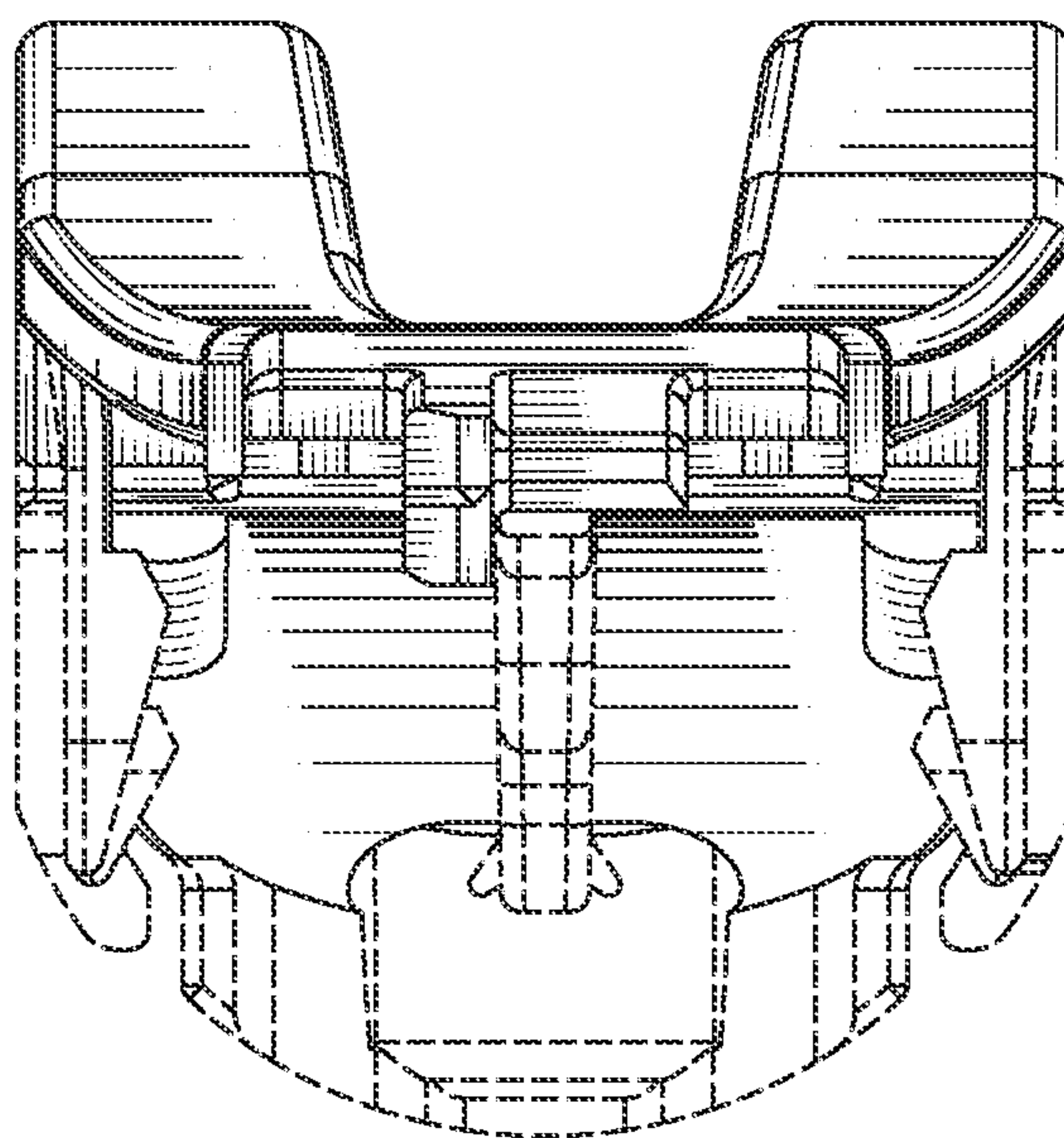


FIG. 7