**IN THE UNITED STATES DISTRICT COURT**
**FOR THE SOUTHERN DISTRICT OF TEXAS**
**GALVESTON DIVISION**

| | | |
|---|---|---|
| SANDBOX LOGISTICS, LLC; and OREN TECHNOLOGIES, LLC | § | |
| | § | Civil Action No.3:16-cv-00012 |
| v. | § | **JURY TRIAL DEMANDED** |
| GRIT ENERGY SOLUTIONS, LLC; PROPPANT EXPRESS INVESTMENTS, LLC; and PROPPANT EXPRESS SOLUTIONS, LLC | § | |

## PLAINTIFFS' THIRD AMENDED COMPLAINT

Plaintiffs SandBox Logistics, LLC and Oren Technologies, LLC (collectively "Plaintiffs" or "SandBox") hereby file their Third Amended Complaint against Defendants Grit Energy Solutions, LLC, Proppant Express Investments, LLC, and Proppant Express Solutions, LLC, allege as follows:

## NATURE OF THE CASE

1. Plaintiffs bring this action for the willful infringement of two patents, U.S. Patent Nos. 9,296,518 and 9,403,626 (collectively, the "asserted patents"), under the patent laws of the United States, 35 U.S.C. § 1, *et seq.* Plaintiffs also bring claims under state law for violation of the Texas Uniform Fraudulent Transfer Act.

## THE PARTIES

2. Plaintiff SandBox Logistics, LLC ("SandBox Logistics") is a Texas limited liability company with a principal place of business at 3200 Southwest Freeway, 13th Floor,

Houston, Texas 77027. All members of SandBox Logistics, LLC reside in and are citizens of Texas.

3. Plaintiff Oren Technologies, LLC ("Oren Technologies") is a Texas limited liability company with a principal place of business at 18515 Aldine Westfield Road, Houston, Texas 77073. All members of Oren Technologies reside in and are citizens of Texas.

4. Defendant Grit Energy Solutions, LLC ("Defendant" or "Grit") is a Montana limited liability company with a principal place of business at 120 Candle Lane, Bozeman, Montana, 59715. Upon information and belief, all of Defendant's members reside in and are citizens of Montana. Grit directly infringes all three patents in suit. Defendant may be served with process by its registered agent for service, Kenneth W. Eiden, III, 120 Candle Lane, Bozeman, Montana 59715.

5. Defendant Proppant Express Investments, LLC ("PropX Investments") is a Delaware limited liability company having its principal place of business at 950 17th Street, Suite 1320, Denver, Colorado 80202. PropX Investments may be served with process through its registered agent for service, The Corporation Trust Company, Corporation Trust Center, 1209 Orange Street, Wilmington, Delaware 19801.

6. Defendant Proppant Express Solutions, LLC ("PropX Solutions") is a Delaware limited liability company having its principal place of business at 950 17th Street, Suite 1320, Denver, Colorado 80202. PropX Solutions may be served with process through its registered agent for service, The Corporation Company, 7700 E. Arapahoe Road, Suite

220, Centennial, Colorado 80112-1268, United States. Unless it is necessary to distinguish a particular entity, the two PropX entities will be referred to collectively as "PropX."

7. Unless it is necessary to distinguish a particular entity, the PropX entities and Grit will be referred to collectively as "Defendants."

## JURISDICTION AND VENUE

8. The Court has subject matter jurisdiction over this action pursuant to 35 U.S.C. § 271, and 28 U.S.C. §§ 1331, 1332 and 1338, as there exists both federal question jurisdiction as well as complete diversity between the parties, and the amount in controversy exceeds $75,000. Additionally, or in the alternative, this Court has supplemental jurisdiction over state law claims under 28 U.S.C. § 1367.

9. The Court has personal jurisdiction over Grit because Grit has, either directly or through intermediaries, conducted business in this District by shipping, distributing, offering for sale, selling, and advertising (including the provision of an interactive web page) its products and services in the State of Texas and/or in this District. Grit, directly or through intermediaries, has purposefully and voluntarily placed one or more of its infringing products and/or services into the stream of commerce with the intention and expectation that they will be purchased and used by consumers in this District.

10. Grit has committed acts of patent infringement within this District by, among other things, marketing, selling or offering to sell products and services that infringe the asserted patents in this District. Grit's infringing products and services were marketed, sold, and/or offered for sale in at least one instance in this District, to Halliburton Energy Services, Inc. ("Halliburton"). The infringing services and products were or are still used

at a site operated by Halliburton, as shown in the video titled "The Grit Stack System – Live Frac" and posted on www.gritstack.com (last visited August 5, 2016), at the 16 second time mark:

11. Halliburton maintains its United States corporate headquarters in this District at 3000 North Sam Houston Parkway East, Houston, Texas 77032. Halliburton operates and directs its hydraulic fracturing operations from this headquarters and, consequently, Grit's infringing services and products were targeted to be offered for sale and demonstrated to and through Halliburton's Houston corporate headquarters. Accordingly, upon information and belief, Grit's infringing services and products would have been offered for sale or sold by Grit to Halliburton within this District. Grit's efforts to offer for sale or sell its infringing services and products persist with other potential customers in this District.

12. Additionally, this Court has personal jurisdiction over Grit because Grit, directly or through intermediaries, has committed voluntary acts constituting fraudulent

transfer within this District with knowledge that the effect of its tortious activities will be felt by citizens within this District. Furthermore, or in the alternative, the Court has personal jurisdiction over Grit under the doctrine of pendent jurisdiction.

13. The Court has personal jurisdiction over PropX because it has, either directly or through intermediaries, conducted business in this State by shipping, distributing, offering for sale, selling, and advertising (including the provision of an interactive web page) its products and services in the State of Texas. For example, PropX has made sales in the Permian Basin near Odessa, Texas.

14. The Court also has personal jurisdiction over the PropX entities because at least one of their respective members is deemed to be a resident of Texas by virtue of being organized under Texas law and/or maintaining, or having a member that maintains, its principal place of business in the State of Texas and this District.

15. Venue is proper in this District over Grit pursuant to 28 U.S.C. §§ 1391(b)(2), in addition to 28 U.S.C. § 1400(b), because Grit regularly conducts business within this District and/or solicits and establishes direct customer, personal and online relationships with persons and entities within this District in order to market, sell or offer to sell the infringing products or services alleged herein, and also because a substantial part of the events or omissions giving rise to the claims occurred within this District.

16. Venue is also proper in this District over PropX pursuant to 28 U.S.C. §§ 1391(b)(1) and 1400(b) because PropX resides in this District or is deemed to reside in this District under 28 U.S.C. §§ 1391(c)(2). In addition, venue is proper in this District because

a substantial part of the events or omissions giving rise to the claims alleged herein occurred within this District.

## OREN INGENUITY

17. Hydraulic fracturing (or "fracking") is a well-stimulation technique in which deep-rock is fractured by injecting high-pressure liquid into a wellbore to create cracks in the rock formations. This technique is often employed by the oil and gas industry to create new channels in the rock, releasing fossil fuels for extraction and increasing ultimate recovery rates from the reservoir. The development and utilization of this method of recovery for oil and gas over recent years has been exponential. It has stimulated the economy of this country and this State enormously and, when properly developed, it holds promise of enhancing American energy independence.

18. Proppant is a solid material, such as sand, that is injected into the wellbore with hydraulic fracturing liquid. The introduction of proppant is critical, as the solid material holds the fractures open after the injection of fluid ceases and hydraulic pressure is removed from the well. With the width of the fractures held open by proppant, flow and extraction of previously hard-to-reach substances is facilitated through the newly created channels. The efficient, economical, and environmentally sound delivery of proppant to well sites is a crucial component of the well fracturing process.

19. Typically, any hydraulic fracturing operation requires a large amount of proppant, which poses a significant logistical challenge for oil and gas producers. Without a reliable supply of proppant, the operation risks disruptions in the pump schedule or downtime—either of which would render the operation less efficient and less profitable.

20. Traditional proppant transportation and storage methods often lead to excessive delays, bottlenecks, and increased costs for a well site's proppant supply. Additionally, these methods create myriad health and safety risks to jobsite workers and nearby communities.

21. Historically, transportation of proppant from sand mines or storage facilities to the well site employs specialty pneumatic tractor-trailers—a combination of a tractor (or truck) with a power take-off unit and a bulk tank trailer originally designed to haul grains and agricultural products. Unlike the general freight fleet, these tractor-trailers are far fewer in number and availability and inefficient for the purpose of transporting proppant. Among other challenges, the process of discharging proppant from a single pneumatic trailer into well site storage can take over an hour. This time-consuming process—combined with a limited number of compartments in which proppant can be deposited at any given time—leads to serious delays and bottlenecks, as some hydraulic fracturing operations require hundreds of pneumatic truckloads of proppant. Further, once on the well site, the proppant is transferred from large, unwieldy storage bins between multiple pieces of equipment before being injected into the wellbore. At each transfer point, the proppant is susceptible to loss or contamination, and workers are exposed to health and safety risks from the silica dust expelled into the air.

22. At least as early as September 2011, John Oren, a co-founder of SandBox, pioneered a proprietary logistics process and containerization solution, which eliminates these, and many other, challenges associated with traditional proppant delivery and storage.

23. The SandBox solution revolutionized the existing pneumatic proppant delivery methods by employing a modular containerized, gravity-driven proppant delivery and discharge system. John Oren and his son, Joshua Oren, continued to refine the system in order to design a smaller container that could be shipped along roadways.

24. As a result, on July 24, 2013, John Oren filed a U.S. patent application which resulted in the issuance of U.S. Patent No. 9,296,518 (the "'518 patent"). A true and correct copy of the '518 patent, titled "Proppant Storage Vessel and Assembly Thereof" and issued on March 29, 2016, is attached hereto as Exhibit A and incorporated herein by reference. The '518 patent claims priority to and benefit of previously filed applications dated December 21, 2011 and October 25, 2012.

25. On August 21, 2015, another U.S. patent application was filed which resulted in the issuance of U.S. Patent No. 9,403,626 (the "'626 patent"). A true and correct copy of the '626 patent, titled "Proppant Storage Vessel and Assembly Thereof" and issued on August 2, 2016, is attached hereto as Exhibit B and incorporated herein by reference. The '626 patent claims priority to and benefit of previously filed applications dated December 21, 2011, October 25, 2012, and July 24, 2013.

26. The '518 patent and the '626 patent are duly and lawfully issued United States patents, each of which is valid and enforceable.

## SANDBOX TECHNOLOGY

27. SandBox was formed by the Orens to commercialize their newly developed technology and inventions. Oren Technologies is the assignee of full title and interest to the asserted patents. SandBox Logistics is the exclusive licensee to the asserted patents.

28. During 2012 and 2013, SandBox worked with a number of manufacturers to build its proppant delivery systems, including Bawco Fabricators, Huber Construction, Agrico Sales, Pro Box, One Way Lease, Shanghai Jingsheng Container Manufacturing Co., Ltd, Shannon Welding, and Cambelt International. SandBox or its representatives entered into non-disclosure agreements with each of these parties in order to safeguard the secrecy of the SandBox proprietary proppant delivery design during this time period.

29. On April 5, 2013, SandBox's proprietary proppant delivery solution was used for the first time in production by Rock Pile Energy in Williston, North Dakota.

**GRIT LEARNS ABOUT SANDBOX'S PROPRIETARY TECHNOLOGY**

30. Cambelt International ("Cambelt"), headquartered in Salt Lake City, Utah, is the manufacturer of SandBox's proprietary conveyor system—an essential piece of equipment that delivers proppant directly from the SandBox container to the blender where it mixes with hydraulic fracturing fluid. SandBox contacted Cambelt in May 2012, and SandBox and Cambelt entered into a non-disclosure agreement on June 5, 2012. By June 13, 2012, Cambelt had submitted a proposal to work with SandBox, and the principal of Cambelt visited the SandBox location in Houston on August 3, 2012. The features and utility of the conveyor that ultimately resulted from that proposal appear in the '341 patent.

31. Shortly thereafter, in or about September/October of 2012—before the first commercial use of SandBox's system—Tim Stefan, one of the founders of Grit, visited Cambelt's offices in Salt Lake City with his wife. He presented some sketches of a conveyor belt used to deliver proppant in a manner very similar to what Cambelt had been discussing with SandBox, and then inquired as to whether Cambelt would build such a

conveyor for his business. The principal of Cambelt explained to Mr. Stefan that he had a conflict of interest and would be very uncomfortable working with him on a project that was so similar to his ongoing project for SandBox.

32. At the present time, Plaintiffs are unaware of how Mr. Stefan obtained information on the SandBox process and how he managed to obtain or create a sketch of a crucial component of that process. Upon information and belief, it is alleged that someone in the industry violated their non-disclosure agreement with SandBox and alerted Mr. Stefan to this revolutionary new process, which Mr. Stefan subsequently attempted to copy.

33. On May 21-22, 2013, SandBox participated at the 3rd Proppants Summit held at the Sheraton Hotel on John F. Kennedy Boulevard in Houston, Texas. There, SandBox distributed brochures and a video showing the benefits of the various features of its proprietary proppant delivery solution.

34. John Oren and Joshua Oren made clear to summit attendees that patents were pending on the SandBox proppant delivery solution and that the technology was propriety to SandBox.

35. While demonstrating the SandBox proppant solution at the Summit, John Oren met Mr. Stefan, who deceptively introduced himself as being affiliated with a sand mining company. As part of SandBox's logistics business includes transporting proppant directly from sand mines, SandBox considered sand mining companies as potential customers—not competitors.

36. In actuality, Mr. Stefan was the Co-Founder and Vice President of Product Development for Grit, a direct competitor of SandBox. Mr. Stefan intentionally told Mr.

Oren that he was affiliated with "Grit Sand"—a fictional, non-existent sand mining company. Mr. Stefan intentionally made these misrepresentations in order to convince Mr. Oren to share information about SandBox's proprietary proppant solution. In reliance on Mr. Stefan's misrepresentation, Mr. Oren believed that Mr. Stefan was a sand miner and that Mr. Stefan's interest in the SandBox proppant solution was that of a potential customer's.

37. Mr. Stefan expressed interest in working with SandBox and in taking a tour of one of the nearby wells where the SandBox system was in operation.

38. Believing Mr. Stefan to be a sand vendor and based on his representations, John Oren showed Mr. Stefan the SandBox proprietary proppant solution in operation on May 23, 2013. As a standard for all tours and demonstrations at the SandBox facilities, John Oren discussed the proprietary nature of SandBox's equipment and system with all visitors. Additionally, prior to his tour, Mr. Stefan was specifically told that the SandBox proppant solution was proprietary, developed by SandBox with patents pending. The tour, which included an inspection of the SandBox proppant solution's equipment and a live demonstration, took place at a SandBox facility located in at 18515 Aldine Westfield Road, Houston, Texas, 77073, not far from the location of the Proppants Summit. SandBox continues to operate this facility to the current day.

39. Mr. Oren would not have shown Mr. Stefan SandBox's proprietary solution if he had known that Mr. Stefan was an actual or a potential competitor.

40. Grit now markets and sells an infringing proppant delivery system called the GRIT STACK™ System which, like the SandBox solution, is a modular containerized,

gravity-driven proppant delivery and discharge system meant to eliminate the challenges posed by the traditional pneumatic-based process. Grit has a federally registered trademark for the GRIT STACK™ System. Grit markets the GRIT STACK™ System on its website, www.gritstack.com (last visited August 5, 2016). Grit further markets the GRIT STACK™ System using YouTube videos, available at https://www.youtube.com/user/gritstack (last visited August 5, 2016).

41. Grit's infringing services and products were marketed, sold, and/or offered for sale in at least one instance, to Halliburton. The infringing services and products were or are still used at a site operated by the Halliburton. Grit's efforts to offer for sale or sell its infringing services and products persist with other potential customers.

42. As a result of Grit's actions, SandBox has been damaged by losing customers, market share, and revenue. Additionally, Grit's actions have forced SandBox to expend unnecessary time and resources to institute the derivation proceedings and clear up the ownership in SandBox's proprietary proppant delivery system. In total, SandBox has been damaged in the amount that exceeds $75,000.

## GRIT JOINS PROPX

43. In September 2016, Grit became a member PropX. The concept behind PropX is that it would be a joint venture providing both proppant and a proppant delivery solution to customers. PropX would thus be a direct competitor to SandBox.

44. PropX was aware of Grit's infringement of SandBox patents because SandBox had filed the Original Complaint in the instant litigation in January 2016.

45. When it joined PropX, Grit transferred all, or substantially all, of its assets to PropX. Grit did not receive reasonably equivalent value in return for these assets.

46. Grit also transferred to PropX some, but not all, of its liability for damages to SandBox in this case. On information and belief, Grit now lacks the assets to satisfy a judgment in the instant lawsuit for willful infringement, punitive damages, or liability for state law claims.

47. One of Grit's managing members was appointed as a director of PropX following the transfer of assets. Grit thus maintains control of the transferred assets. Other managing members of Grit are now PropX employees.

48. PropX has used Grit's system since September 2016, despite knowing that it infringes SandBox patents.

## CAUSES OF ACTION

### Count I – Infringement of U.S. Patent No. 9,296,518

### (Against Grit)

49. SandBox incorporates herein each of the allegations above.

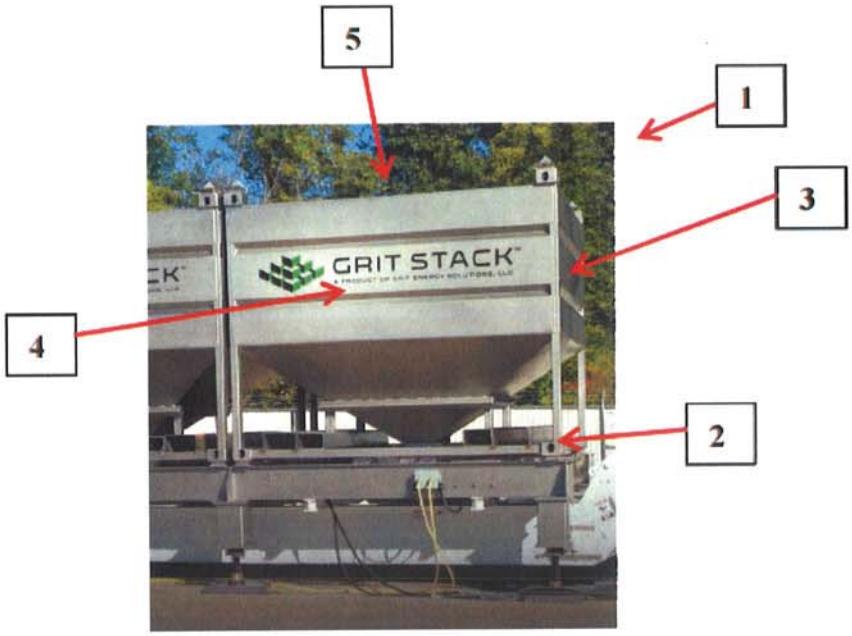
50. Grit infringes, induces infringement, and/or contributes to the infringement of the '518 patent by making, using, selling, offering for sale, or importing into the United States, or by intending that others make, use, import into, offer for sale, or sell in the United States, products and/or methods covered by one or more Claims of the '518 patent.

51. Grit's products and/or services that infringe the '518 patent include but are not limited to components of the GRIT STACK™ proppant delivery system.

52. Grit makes, uses, sells, offers for sale, and/or imports the GRIT STACK™ System and components thereof into this District and elsewhere in the United States.

53. Grit's GRIT STACK™ System and components thereof directly infringe—literally and/or under the doctrine of equivalents—at least Claims 1-6, 8, 10, and 15 of the '518 patent.

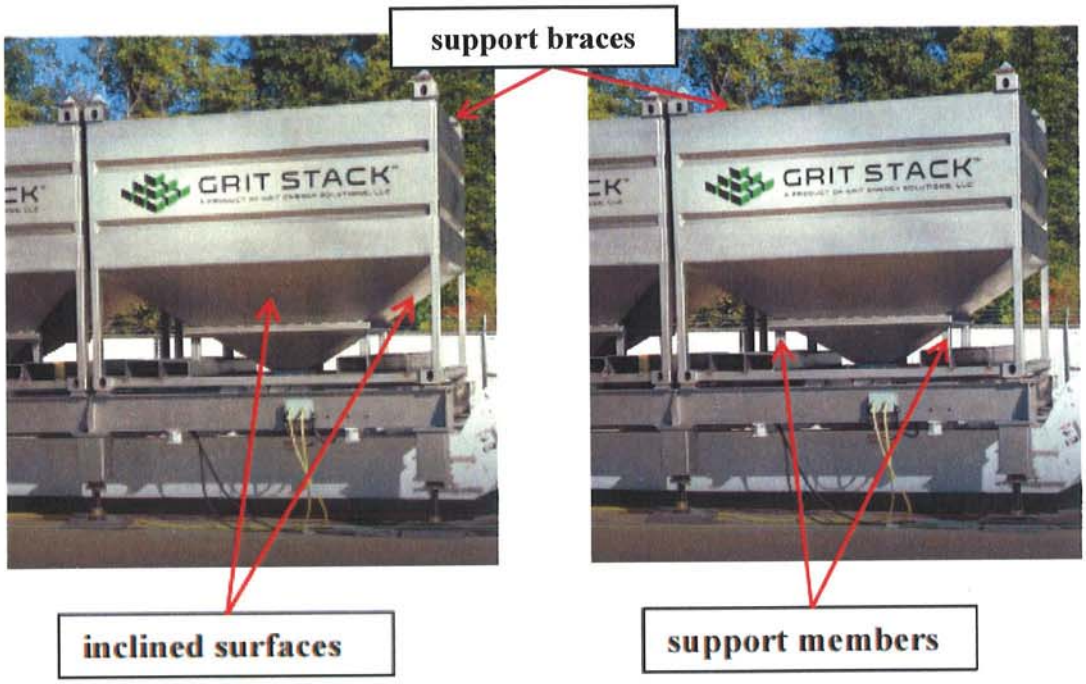
54. By way of example only, as shown on Grit's website www.gritstack.com (last visited August 5, 2016), the GRIT STACK™ System infringes upon Claim 1 of the '518 patent in that it includes a container (1) having cavity (5, internal to the container), sidewalls (3, 4, and walls opposite to 3 and 4), and a bottom wall (2).




55. As shown in the video entitled "The Grit Stack System – Live Frac," at the 35 second time mark, www.gritstack.com (last visited August 5, 2016), the GRIT STACK™ System also includes a bottom hatch (6) positioned closely adjacent to the

bottom (2) and selectively moveable to an open configuration that is circumscribed by the sidewalls (3, 4) when in the open configuration.


56. The GRIT STACK™ System includes inclined surfaces defining a lower periphery of the cavity. The inclined surfaces depend axially away and extend inwardly from the sidewalls (3, 4). Moreover, the GRIT STACK™ System includes support members that extend between the bottom and inclined surfaces, as well as support braces affixed to the sidewalls, as generally recited in Claim 1 of the '518 patent, as shown in the photographs below:




57. Grit also indirectly infringes the '518 patent as provided in 35 U.S.C. § 271(b) by inducing infringement by others, in this District and elsewhere in the United States. For example, customers and end-users of the GRIT STACK™ System and components thereof directly infringe by using, offering for sale, selling and/or importing the inventions claimed in the '518 patent. Grit's customers who purchase the GRIT STACK™ System and components thereof and operate the system and components in accordance with Grit's instructions directly infringe one or more Claims of the '518 patent.

58. Grit also indirectly infringes the '518 patent as provided in 35 U.S.C. § 271(c) by contributing to the infringement by others, in this District and elsewhere in the United States because the inventions of the '518 patent have no substantial non-infringing uses. For example, customers and end-users of the GRIT STACK™ System and components thereof directly infringe by using, offering for sale, selling and/or importing the inventions claimed in the '518 patent. Grit's customers who purchase the GRIT

STACK™ System and components thereof and operate the system and components in accordance with Grit's instructions directly infringe one or more Claims of the '518 patent.

59. Grit's infringement of the '518 patent is without license or other authorization.

60. Grit's infringement of the '518 patent has been and continues to be willful. Specifically, Grit has been on notice of the application that issued as the '518 patent at least since April 10, 2014. On that date, Grit filed an Information Disclosure Statement in connection with a patent application, serial number 14/249,420 (the "'420 application"), which listed each parent application to the application that issued as the '518 patent. The '420 application names six total inventors. Four of the named inventors on the '420 application are or were part of Grit's management team.

61. Grit's continued infringement of the '518 patent has damaged and will continue to damage SandBox in the amount to be proven at trial.

62. The continuing infringement of the '518 patent by Grit and those acting in concert with Grit are causing and will continue to cause irreparable harm to SandBox.

**Count II – Infringement of U.S. Patent No. 9,403,626**

**(Against Grit)**

63. SandBox incorporates herein each of the allegations above.

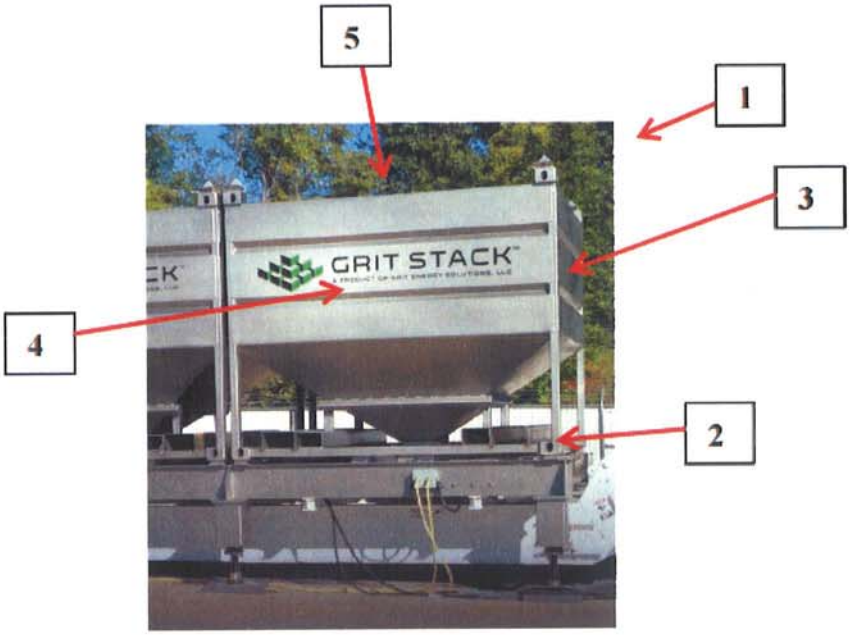
64. Grit infringes, induces infringement, and/or contributes to the infringement of the '626 patent by making, using, selling, offering for sale, or importing into the United States, or by intending that others make, use, import into, offer for sale, or sell in the United States, products and/or methods covered by one or more Claims of the '626 patent.

65. Grit's products and/or services that infringe the '626 patent include but are not limited to components of the GRIT STACK™ proppant delivery system.

66. Grit makes, uses, sells, offers for sale, and/or imports the GRIT STACK™ System and components thereof into this District and elsewhere in the United States.

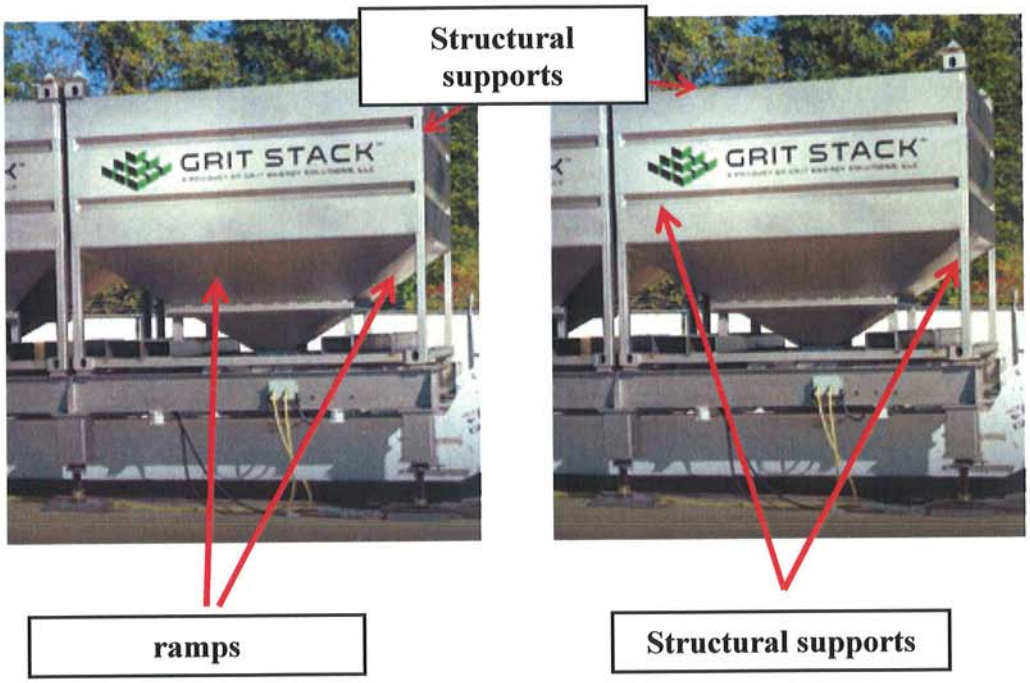
67. Grit's GRIT STACK™ System and components thereof directly infringe—literally and/or under the doctrine of equivalents—at least Claims 7, 12, 13, 16, and 17 of the '626 patent.

68. By way of example only, as shown on Grit's website www.gritstack.com (last visited August 5, 2016), the GRIT STACK™ System infringes upon Claim 7 of the '626 patent in that it includes a container (1) having a first top (5), sidewalls (3, 4, and walls opposite to 3 and 4), and a first bottom (2). As shown, the sidewalls (3, 4) are coupled to the top (5) and bottom (2) to define an interior volume (not visible) of the container (1).

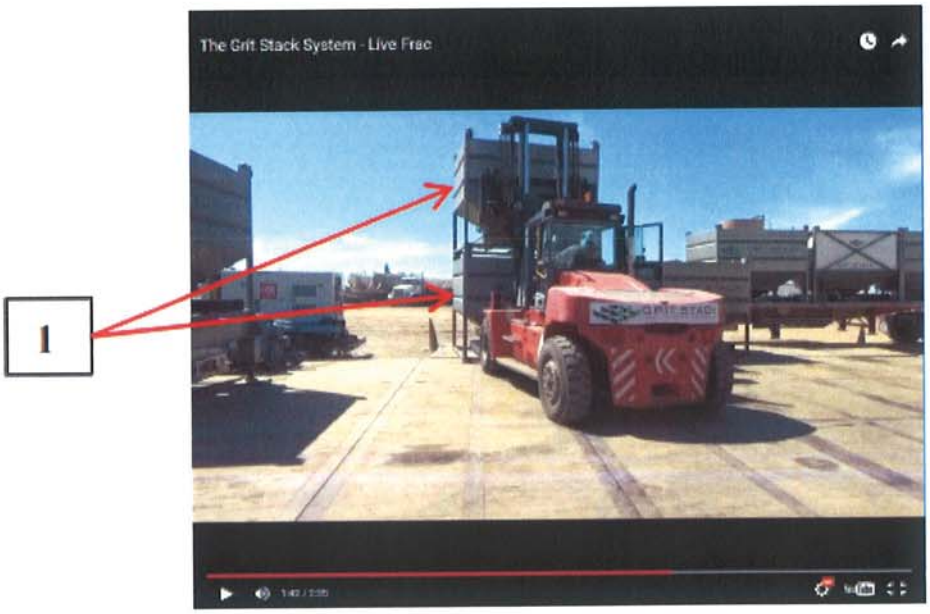


69. As shown in the video entitled "The Grit Stack System – Live Frac," at the 35 second time mark, www.gritstack.com (last visited August 5, 2016), the GRIT STACK™ System also includes an outlet (6) in the first bottom (2) to allow large volumes of proppant to flow therefrom when the outlet (6) is in an open position.


70. The GRIT STACK™ System includes a plurality of ramps extending downwardly and inwardly from the sidewalls (3, 4). Moreover, the GRIT STACK™ System includes a plurality of structural supports to provide structural support to the sidewalls (3, 4), as generally recited in Claim 7 of the '626 patent, as shown in the photographs below:




71. Moreover, with respect to Claim 7 of the '626 patent, the containers (1) of the GRIT STACK™ System are stackable such that a first container can be supported in spaced relation above a second container in a manner that meets every limitation of Claim 7.



72. Furthermore, the GRIT STACK™ System includes a conveyor positioned below the outlet of the stacked containers (1). For example, in the '420 application, Grit illustrates stacked containers above a conveyor.

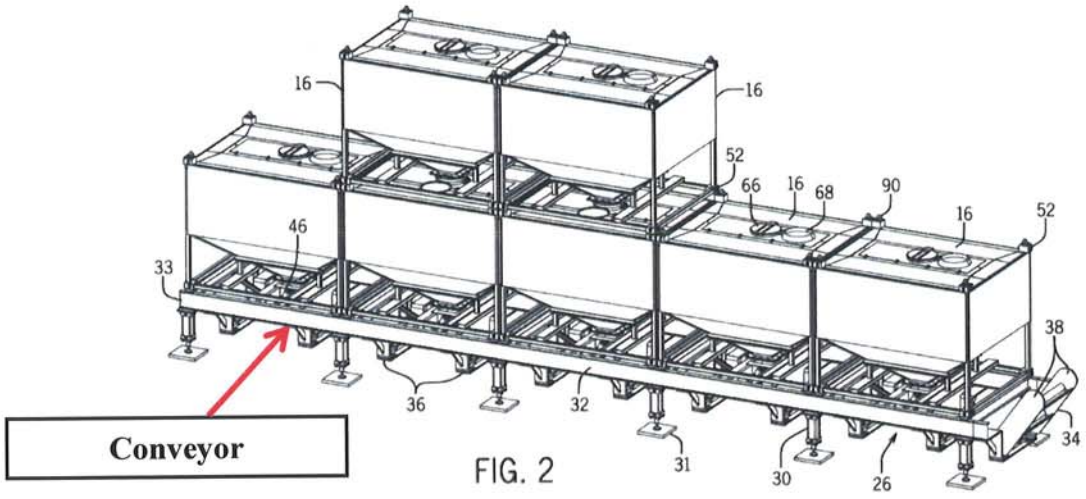



FIG. 2

73. Grit also indirectly infringes the '626 patent as provided in 35 U.S.C. § 271(b) by inducing infringement by others, in this District and elsewhere in the United States. For example, customers and end-users of the GRIT STACK™ System and components thereof directly infringe by using, offering for sale, selling and/or importing the inventions claimed in the '626 patent. Grit's customers who purchase the GRIT STACK™ System and components thereof and operate the system and components in accordance with Grit's instructions directly infringe one or more Claims of the '626 patent.

74. Grit also indirectly infringes the '626 patent as provided in 35 U.S.C. § 271(c) by contributing to the infringement by others, in this District and elsewhere in the United States because the inventions of the '626 patent have no substantial non-infringing uses. For example, customers and end-users of the GRIT STACK™ System and

components thereof directly infringe by using, offering for sale, selling and/or importing the inventions claimed in the '626 patent. Grit's customers who purchase the GRIT STACK™ System and components thereof and operate the system and components in accordance with Grit's instructions directly infringe one or more Claims of the '518 patent.

75. Grit's infringement of the '626 patent is without license or other authorization.

76. Grit's infringement of the '626 patent has been and continues to be willful. Specifically, Grit has been on notice of the parent application that issued as the '626 patent at least since April 10, 2014. On that date, an Information Disclosure Statement was filed in Grit's '420 application, which listed the two parent applications to the application that issued as the '626 patent. The '420 application names six total inventors. Four of the named inventors on the '420 application are or were part of Grit's management team.

77. Grit's continued infringement of the '626 patent has damaged and will continue to damage SandBox in the amount to be proven at trial.

78. The continuing infringement of the '626 patent by Grit and those acting in concert with Grit are causing and will continue to cause irreparable harm to SandBox.

**Count III: Violations of the Texas Uniform Fraudulent Transfer Act**

**(Against Grit and PropX)**

79. SandBox incorporates herein each of the allegations above.

80. When it joined PropX in September 2016, Grit transferred all or substantially all of its assets to PropX. Grit did not receive reasonably equivalent value in return for these assets.

81. Grit also transferred to PropX some, but not all, of its liability for damages to SandBox in the instant lawsuit. On information and belief, Grit now lacks the assets to satisfy a judgment in the instant lawsuit for (1) willful infringement, (2) punitive damages, or (3) liability for state law claims.

82. One of Grit's managing members was appointed as a director of PropX following the transfer of assets. Grit thus maintains control of the transferred assets. Other managing members of Grit are now PropX employees.

83. PropX has used Grit's system since September 2016, despite knowing that it infringes SandBox patents.

84. The transfer from Grit to PropX was done with actual intent to hinder, delay or defraud SandBox from recovery in the instant lawsuit. The transfer was made with actual intent to hinder or delay SandBox's recovery because the transfer was to an insider, Grit maintained control of the assets after the transfer, Grit concealed the transfer from SandBox, and the transfer occurred after the filing of Plaintiffs' Original Complaint in the instant lawsuit.

85. PropX and Grit lacked good faith in executing the transfer because the value of the consideration received by Grit was not reasonably equivalent to the amount of obligation incurred by Grit. They structured the transaction to leave Grit unable to satisfy a judgment in this case. After the transfer, Grit was left with unreasonably small capital to operate its business, was unable to pay its debts as they became due, and had assets whose value did not exceed its liabilities, especially in light of the instant lawsuit.

86. SandBox is a present creditor against Grit due to its pending claim against Grit in the instant lawsuit that existed at the time the transfer occurred. SandBox has been damaged by the transfer because it hinders SandBox's future recovery of damages in this case. Moreover, SandBox has incurred substantial costs to investigate the transfer and bring claims against Defendants.

87. Defendants' actions have damaged and will continue to damage SandBox in an amount greater than the jurisdictional minimal limits of this Court.

## DEMAND FOR JURY TRIAL

SandBox respectfully requests a jury trial on any issues so triable by right.

## PRAYER FOR RELIEF

WHEREFORE, SandBox respectfully requests that this Court enter judgment in its favor and grant the following relief:

A. A judgment that Grit infringes '518 and '626 patents;

B. A judgment and order requiring Grit to pay SandBox damages in an amount adequate to compensate SandBox for Grit's infringement of the '518 and '626 patents, but in no event less than a reasonable royalty under 35 U.S.C. § 284;

C. A judgment that Grit's infringement of the '518 and '626 patents was and continues to be willful;

D. A judgment and order requiring Grit to pay prejudgment and post-judgment interest to the fullest extent allowed under the law;

E. An injunction enjoining Grit, and all others in active concert with Grit, from infringement of the '518 and '626 patents;

F. An order finding that this is an exceptional case and awarding SandBox its reasonable attorneys' fees pursuant to 35 U.S.C. § 285;

G. A judgment that Grit and PropX have engaged in a fraudulent transfer of Grit's assets to PropX;

H. A judgment and order allowing SandBox to avoid Grit's transfer of assets to PropX to the extent necessary to satisfy its claim against Defendants;

I. An order awarding SandBox its costs and fees; and

J. Such other relief as the Court may deem appropriate and just under the circumstances.

Dated: April 13, 2017

Respectfully submitted,

By: /s/ *Matthew P. Whitley*

Matthew P. Whitley
State Bar No. 24037703
Southern District No. 33589
mwhitley@beckredden.com
BECK REDDEN LLP
1221 McKinney St., Suite 4500
Houston, Texas 77010-2010
Telephone: (713) 951-3700
Facsimile: (713) 951-3720
ATTORNEY-IN-CHARGE FOR PLAINTIFFS

**Of Counsel:**
Michael Richardson
State Bar No. 24002838
Southern District No. 23630
mrichardson@beckredden.com

Seepan Parseghian
State Bar No. 24099767
Southern District No. 2953872
sparseghian@beckredden.com
BECK REDDEN LLP
1221 McKinney St., Suite 4500
Houston, Texas 77010-2010
Telephone: (713) 951-3700
Facsimile: (713) 951-3720

Gianni Cutri (*pro hac vice*)
Illinois State Bar No. 6272109
gcutri@kirkland.com
Kyle M. Kantarek (*pro hac vice*)
Illinois State Bar No. 6320889
kyle.kantarek@kirkland.com
Adam M. Kaufmann (*pro hac vice*)
Illinois State Bar No. 6303658
adam.kaufman@kirkland.com
KIRKLAND & ELLIS LLP
300 North LaSalle
Chicago, IL 60654
Telephone: (312) 862-3372
Facsimile: (312) 862-2200

**CERTIFICATE OF SERVICE**

The undersigned certifies that the foregoing document was filed electronically and served upon all counsel of record via the Court's CM/ECF system on April 13, 2017.

By: */s/ Matthew P. Whitley*
Matthew P. Whitley

# EXHIBIT A

US009296518B2

(12) **United States Patent**
**Oren**

(10) **Patent No.: US 9,296,518 B2**
(45) **Date of Patent: Mar. 29, 2016**

(54) **PROPPANT STORAGE VESSEL AND ASSEMBLY THEREOF**

(71) Applicant: **Oren Technologies, LLC**, Houston, TX (US)

(72) Inventor: **John Oren**, Houston, TX (US)

(73) Assignee: **Oren Technologies, LLC**, Houston, TX (US)

( * ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **13/949,693**

(22) Filed: **Jul. 24, 2013**

(65) **Prior Publication Data**

US 2014/0246341 A1 Sep. 4, 2014

**Related U.S. Application Data**

(63) Continuation-in-part of application No. 13/660,840, filed on Oct. 25, 2012, now Pat. No. 8,505,780, and a continuation of application No. 13/332,937, filed on Dec. 21, 2011, now Pat. No. 8,827,118.

(51) **Int. Cl.**

| | |
|---|---|
| ***B65D 25/08*** | (2006.01) |
| ***B65D 88/32*** | (2006.01) |
| ***B65D 90/14*** | (2006.01) |

(52) **U.S. Cl.**

CPC ..... ***B65D 25/08*** (2013.01); ***B65D 88/32*** (2013.01); ***B65D 90/14*** (2013.01)

(58) **Field of Classification Search**

CPC ..... B65D 88/64; B65D 90/14; B65D 88/32
USPC ..... 222/185.1, 145.1, 143, 145.2, 145.5, 222/460–462; 220/601, 646, 221, 565; 414/288, 328

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

| | | | |
|---|---|---|---|
| 137,871 | A | 4/1873 | Worsley |
| 150,894 | A | 5/1874 | Safely |
| 1,143,641 | A | 6/1915 | McGregor |
| 1,331,883 | A | 2/1920 | Stuart |
| 1,434,488 | A | 11/1922 | Forsythe |

(Continued)

FOREIGN PATENT DOCUMENTS

| | | |
|---|---|---|
| CA | 2791088 | 9/2012 |
| JP | 410087046 | 4/1998 |

(Continued)

OTHER PUBLICATIONS

International Search Report for related International Application No. PCT/US2012/066639.

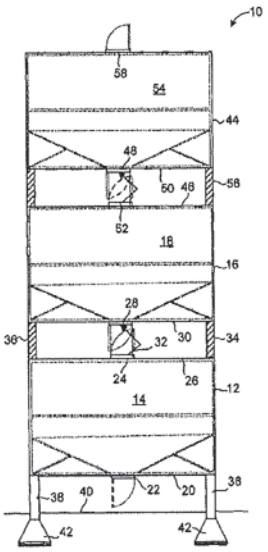
(Continued)

*Primary Examiner* — Donnell Long
(74) *Attorney, Agent, or Firm* — Hogan Lovells US LLP

(57) **ABSTRACT**

A proppant storage vessel has a container having a first end wall, a second end wall, a first side wall, a second side wall, a top wall and a bottom wall. The first and second end walls extend between opposite ends of the first and second side walls. The walls define an interior volume of the container. The walls have a rigidity suitable for retaining no less than 30,000 pounds of proppant therein. A top hatch is formed centrally on the top wall and is movable between an open position and a closed position. A bottom hatch is formed generally centrally on the bottom wall of the container and is movable between an open position and a closed position.

**15 Claims, 4 Drawing Sheets**



(56) **References Cited**

U.S. PATENT DOCUMENTS

| | | | | |
|---|---|---|---|---|
| 1,573,664 | A | | 2/1926 | Wetherill |
| 1,850,000 | A | | 3/1932 | Fernand |
| 2,616,758 | A | | 11/1952 | Meyers |
| 2,622,771 | A | * | 12/1952 | Tulou ..... 222/502 |
| 2,652,174 | A | | 9/1953 | Shea et al. |
| 2,865,521 | A | | 12/1958 | Fisher et al. |
| 2,894,666 | A | | 7/1959 | Campbell, Jr. |
| 3,083,879 | A | | 4/1963 | Coleman |
| 3,090,527 | A | | 5/1963 | Rensch |
| 3,248,026 | A | | 4/1966 | Kemp |
| 3,270,921 | A | | 9/1966 | Nadolske et al. |
| 3,281,006 | A | | 10/1966 | Wei |
| 3,294,306 | A | | 12/1966 | Areddy |
| 3,318,473 | A | * | 5/1967 | Jones et al. ..... 414/608 |
| 3,378,152 | A | | 4/1968 | Warner |
| 3,387,570 | A | | 6/1968 | Pulcrano et al. |
| 3,397,654 | A | | 8/1968 | Snyder |
| 3,407,971 | A | | 10/1968 | Oehler |
| 3,561,633 | A | | 2/1971 | Morrison et al. |
| 3,587,834 | A | | 6/1971 | Dugge |
| 3,601,244 | A | | 8/1971 | Ort et al. |
| 3,602,400 | A | | 8/1971 | Cooke |
| 3,661,293 | A | | 5/1972 | Gerhard et al. |
| 3,738,511 | A | | 6/1973 | Lemon et al. |
| 3,785,534 | A | | 1/1974 | Smith |
| 3,986,708 | A | | 10/1976 | Hellzel et al. |
| 4,004,700 | A | | 1/1977 | Empey |
| 4,063,656 | A | | 12/1977 | Lambert |
| 4,138,163 | A | * | 2/1979 | Calvert et al. ..... 406/129 |
| 4,210,273 | A | | 7/1980 | Hegele |
| RE30,358 | E | | 8/1980 | Sensibar |
| 4,239,424 | A | | 12/1980 | Pavolka |
| 4,247,228 | A | | 1/1981 | Gray et al. |
| 4,265,266 | A | | 5/1981 | Kierbow et al. |
| 4,282,988 | A | | 8/1981 | Hulbert, Jr. |
| 4,350,241 | A | | 9/1982 | Wenzel |
| 4,359,176 | A | | 11/1982 | Johnson |
| 4,363,396 | A | | 12/1982 | Wolf et al. |
| 4,397,406 | A | | 8/1983 | Croley |
| 4,398,653 | A | | 8/1983 | Daloisio |
| 4,402,392 | A | | 9/1983 | Fabian et al. |
| 4,407,202 | A | | 10/1983 | McCormick |
| 4,428,504 | A | | 1/1984 | Bassett et al. |
| 4,449,861 | A | | 5/1984 | Saito et al. |
| 4,608,931 | A | | 9/1986 | Ruhmann et al. |
| 4,626,155 | A | | 12/1986 | Hlinsky et al. |
| 4,701,095 | A | | 10/1987 | Berryman et al. |
| 4,715,754 | A | | 12/1987 | Scully |
| 4,738,774 | A | | 4/1988 | Patrick |
| 4,801,389 | A | | 1/1989 | Brannon et al. |
| 4,819,830 | A | | 4/1989 | Schultz |
| 4,848,605 | A | | 7/1989 | Wise |
| 4,909,556 | A | | 3/1990 | Koskinen |
| 4,919,583 | A | | 4/1990 | Speakman, Jr. |
| 4,946,068 | A | | 8/1990 | Erickson et al. |
| 4,975,205 | A | | 12/1990 | Sloan |
| 4,995,522 | A | | 2/1991 | Barr |
| 5,004,400 | A | | 4/1991 | Handke |
| 5,069,352 | A | | 12/1991 | Harbolt et al. |
| 5,105,858 | A | | 4/1992 | Levinson |
| 5,199,826 | A | | 4/1993 | Lawrence |
| 5,201,546 | A | | 4/1993 | Lindsay |
| 5,224,635 | A | | 7/1993 | Wise |
| 5,286,158 | A | | 2/1994 | Zimmerman |
| 5,373,792 | A | | 12/1994 | Pileggi et al. |
| 5,402,915 | A | | 4/1995 | Hogan |
| 5,413,154 | A | | 5/1995 | Hurst, Jr. et al. |
| 5,429,259 | A | | 7/1995 | Robin |
| 5,441,321 | A | * | 8/1995 | Karpisek ..... 294/68.21 |
| 5,445,289 | A | * | 8/1995 | Owen ..... 222/105 |
| 5,470,175 | A | | 11/1995 | Jensen et al. |
| 5,538,286 | A | | 7/1996 | Hoff |
| 5,564,599 | A | | 10/1996 | Barber et al. |
| 5,613,446 | A | | 3/1997 | DiLuigi et al. |
| RE35,580 | E | | 8/1997 | Heider et al. |
| 5,687,881 | A | | 11/1997 | Rouse et al. |
| 5,690,466 | A | | 11/1997 | Gaddis et al. |
| 5,706,614 | A | | 1/1998 | Wiley et al. |
| 5,761,854 | A | | 6/1998 | Johnson et al. |
| 5,762,222 | A | | 6/1998 | Liu |
| 5,782,524 | A | | 7/1998 | Heider et al. |
| 5,806,863 | A | | 9/1998 | Heger et al. |
| 5,836,480 | A | | 11/1998 | Epp et al. |
| 5,876,172 | A | | 3/1999 | Di Rosa |
| 5,911,337 | A | | 6/1999 | Bedeker |
| 5,927,558 | A | | 7/1999 | Bruce |
| 5,971,219 | A | | 10/1999 | Karpisek |
| 6,002,063 | A | | 12/1999 | Bilak et al. |
| 6,069,118 | A | | 5/2000 | Hinkel et al. |
| 6,077,068 | A | | 6/2000 | Okumura |
| 6,109,486 | A | | 8/2000 | Lee |
| 6,120,233 | A | | 9/2000 | Adam |
| 6,155,175 | A | | 12/2000 | Rude et al. |
| 6,190,107 | B1 | | 2/2001 | Lanigan et al. |
| 6,192,985 | B1 | | 2/2001 | Hinkel et al. |
| 6,205,938 | B1 | | 3/2001 | Foley et al. |
| 6,247,594 | B1 | | 6/2001 | Garton |
| 6,283,212 | B1 | | 9/2001 | Hinkel et al. |
| 6,306,800 | B1 | | 10/2001 | Samuel et al. |
| 6,328,156 | B1 | | 12/2001 | Ostman |
| 6,328,183 | B1 | | 12/2001 | Coleman |
| 6,364,584 | B1 | | 4/2002 | Taylor |
| 6,401,983 | B1 | | 6/2002 | McDonald et al. |
| 6,415,909 | B1 | | 7/2002 | Mitchell et al. |
| 6,457,291 | B2 | | 10/2002 | Wick |
| 6,508,615 | B2 | | 1/2003 | Taylor |
| 6,660,693 | B2 | | 12/2003 | Miller et al. |
| 6,720,290 | B2 | | 4/2004 | England et al. |
| 6,772,912 | B1 | | 8/2004 | Schall et al. |
| 6,776,235 | B1 | | 8/2004 | England |
| 6,783,032 | B2 | | 8/2004 | Fons |
| 6,811,048 | B2 | | 11/2004 | Lau |
| 6,828,280 | B2 | | 12/2004 | England et al. |
| 6,835,041 | B1 | | 12/2004 | Albert |
| 6,902,061 | B1 | | 6/2005 | Elstone |
| 6,915,854 | B2 | | 7/2005 | England et al. |
| 6,953,119 | B1 | | 10/2005 | Wening |
| 6,968,946 | B2 | * | 11/2005 | Shuert ..... 206/386 |
| 7,084,095 | B2 | | 8/2006 | Lee et al. |
| 7,104,425 | B2 | | 9/2006 | Le Roy |
| 7,140,516 | B2 | | 11/2006 | Bothor |
| 7,240,681 | B2 | | 7/2007 | Saik |
| 7,252,309 | B2 | | 8/2007 | Eng Soon et al. |
| 7,284,579 | B2 | | 10/2007 | Elgan et al. |
| 7,316,333 | B2 | | 1/2008 | Wegner |
| 7,475,796 | B2 | | 1/2009 | Garton |
| 7,513,280 | B2 | | 4/2009 | Brashears et al. |
| 7,921,783 | B2 | | 4/2011 | Forbes et al. |
| 7,967,161 | B2 | | 6/2011 | Townsend |
| 8,083,083 | B1 | | 12/2011 | Mohns |
| 8,201,520 | B2 | | 6/2012 | Meritt |
| 8,505,780 | B2 | | 8/2013 | Oren |
| 8,545,148 | B2 | * | 10/2013 | Wanek-Pusset et al. ..... 410/68 |
| 8,585,341 | B1 | | 11/2013 | Oren |
| 8,616,370 | B2 | | 12/2013 | Allegretti |
| 8,622,251 | B2 | | 1/2014 | Oren |
| 8,668,430 | B2 | | 3/2014 | Oren |
| 8,827,118 | B2 | | 9/2014 | Oren |
| 8,887,914 | B2 | | 11/2014 | Allegretti |
| 2001/0022308 | A1 | | 9/2001 | Epp et al. |
| 2002/0139643 | A1 | | 10/2002 | Peltier et al. |
| 2003/0111470 | A1 | | 6/2003 | Fouillet et al. |
| 2004/0084874 | A1 | | 5/2004 | McDougall |
| 2004/0245284 | A1 | | 12/2004 | Mehus et al. |
| 2005/0158158 | A1 | | 7/2005 | Porta |
| 2005/0201851 | A1 | | 9/2005 | Jonkka |
| 2006/0180062 | A1 | | 8/2006 | Furrer et al. |
| 2006/0180232 | A1 | * | 8/2006 | Glewwe et al. ..... 141/2 |
| 2006/0239806 | A1 | | 10/2006 | Yelton |
| 2006/0267377 | A1 | | 11/2006 | Lusk et al. |
| 2007/0125543 | A1 | | 6/2007 | McNeel et al. |
| 2008/0008562 | A1 | | 1/2008 | Beckel et al. |
| 2008/0029546 | A1 | | 2/2008 | Shuld |
| 2008/0029553 | A1 | | 2/2008 | Culleton |

(56) **References Cited**

U.S. PATENT DOCUMENTS

| | | | | |
|---|---|---|---|---|
| 2008/0179054 | A1 | 7/2008 | McGough et al. | |
| 2008/0179324 | A1 | 7/2008 | McGough et al. | |
| 2008/0213073 | A1 | 9/2008 | Benedict et al. | |
| 2008/0226434 | A1 * | 9/2008 | Smith et al. | 414/332 |
| 2008/0264641 | A1 | 10/2008 | Slabaugh et al. | |
| 2009/0038242 | A1 | 2/2009 | Cope | |
| 2009/0078410 | A1 | 3/2009 | Krenek et al. | |
| 2010/0038143 | A1 | 2/2010 | Burnett et al. | |
| 2010/0040446 | A1 | 2/2010 | Renyer | |
| 2011/0011893 | A1 | 1/2011 | Cerny | |
| 2011/0101040 | A1 | 5/2011 | Weissbrod | |
| 2012/0219391 | A1 | 8/2012 | Teichrob et al. | |
| 2013/0004272 | A1 * | 1/2013 | Mintz | 414/304 |
| 2013/0022441 | A1 | 1/2013 | Uhryn et al. | |
| 2013/0206415 | A1 | 8/2013 | Sheesley | |
| 2013/0209204 | A1 | 8/2013 | Sheesley | |
| 2013/0309052 | A1 | 11/2013 | Luharuka | |
| 2014/0083554 | A1 | 3/2014 | Harris | |
| 2014/0097182 | A1 | 4/2014 | Sheesley | |
| 2014/0166647 | A1 | 6/2014 | Sheesley | |
| 2014/0203046 | A1 | 7/2014 | Allegretti | |
| 2014/0234059 | A1 | 8/2014 | Thomeer | |
| 2014/0321950 | A1 | 10/2014 | Krenek et al. | |

FOREIGN PATENT DOCUMENTS

| | | |
|---|---|---|
| JP | 10264882 A | 10/1998 |
| MX | 2012011046 | 9/2012 |
| WO | 2012058059 | 5/2012 |

OTHER PUBLICATIONS

International Search Report for related International Application No. PCT/US2013/035442.

International Search Report for related International Application No. PCT/US2013/032819.

International Preliminary Report on Patentability for PCT/US2013/032819, Sep. 23, 2016, (6 pages).

International Search Report for PCT/US2015/012990, dated May 6, 2015. (15 pages).

FS-35 Desert Frac-Sanders. NOV (National Oilwell Varco). Mar. 19, 2012. (https://web.archive.org/web/20120319070423/http://www.nov.com/Well_Service_and_Completion/Frac_Sand_Handling_Equipment/Frac_Sanders/FS-35.aspx).

File History for U.S. Appl. No. 61/538,616, Robert A. Harris, Sep. 23, 2011. (21 pages).

* cited by examiner

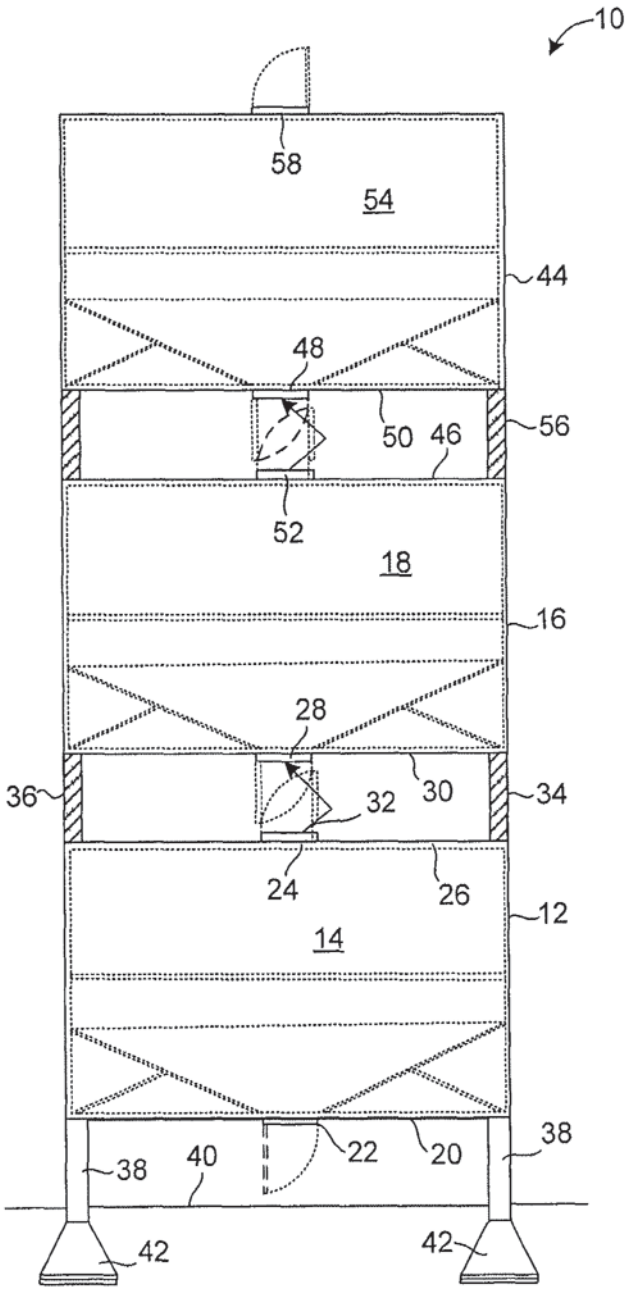



FIG. 1

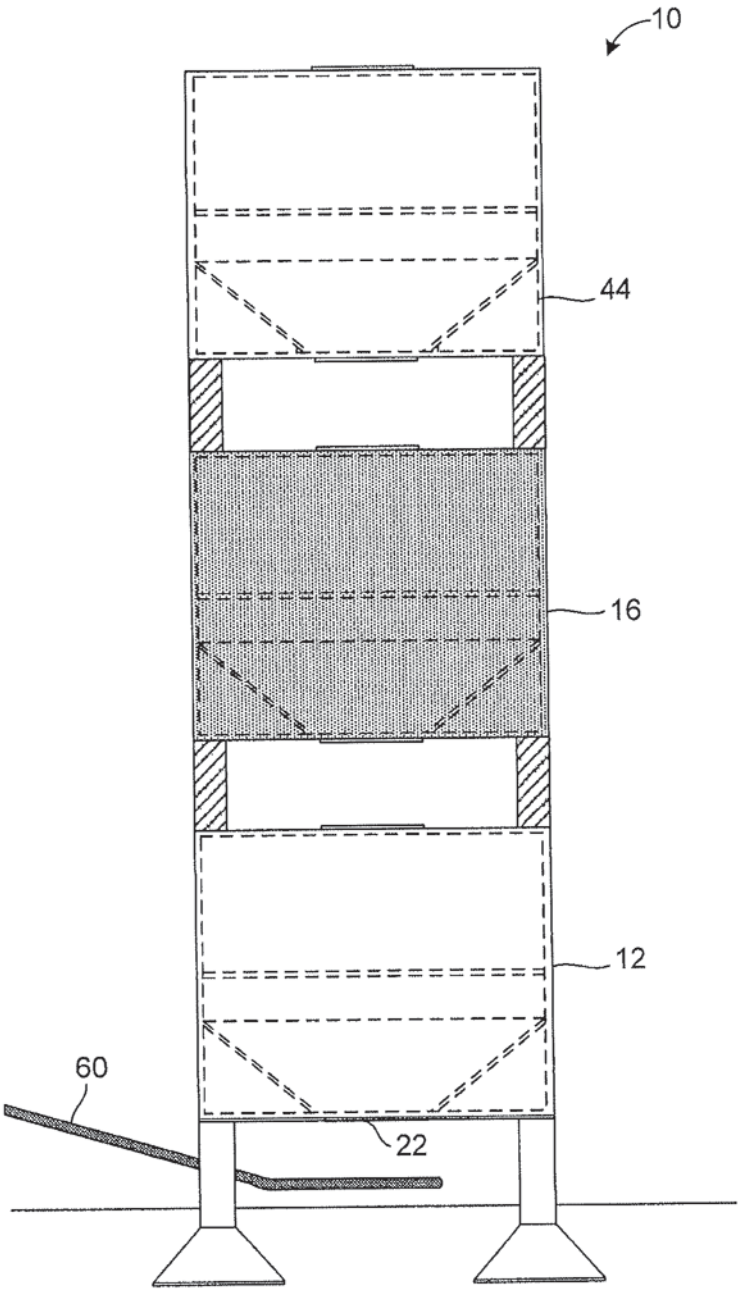



FIG. 2

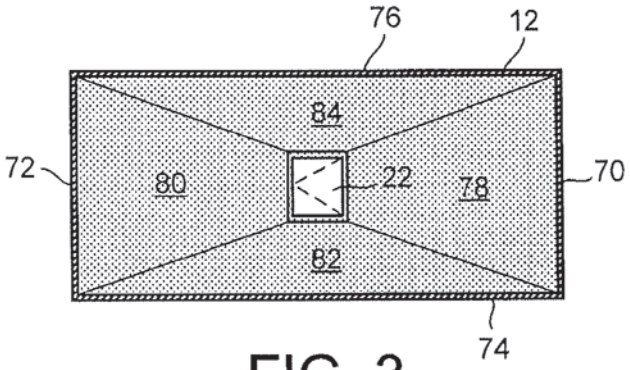



FIG. 3

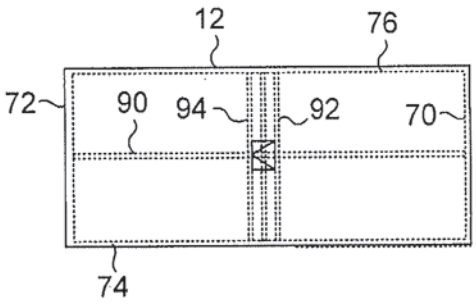



FIG. 4

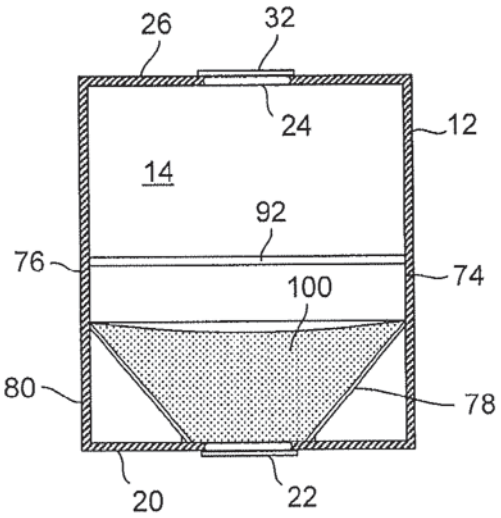



FIG. 5

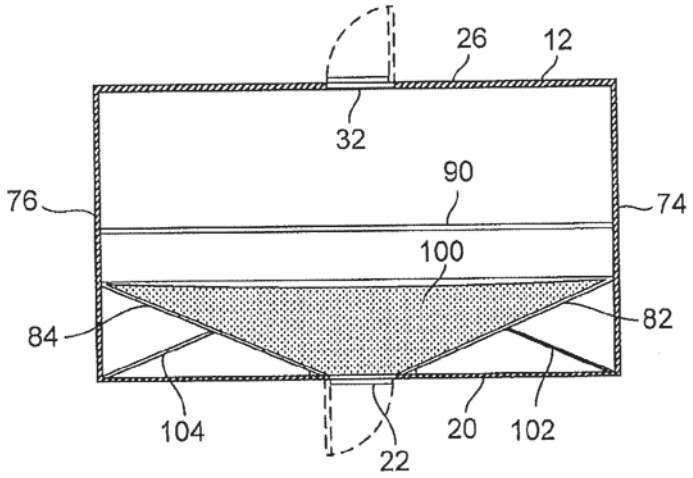



FIG. 6

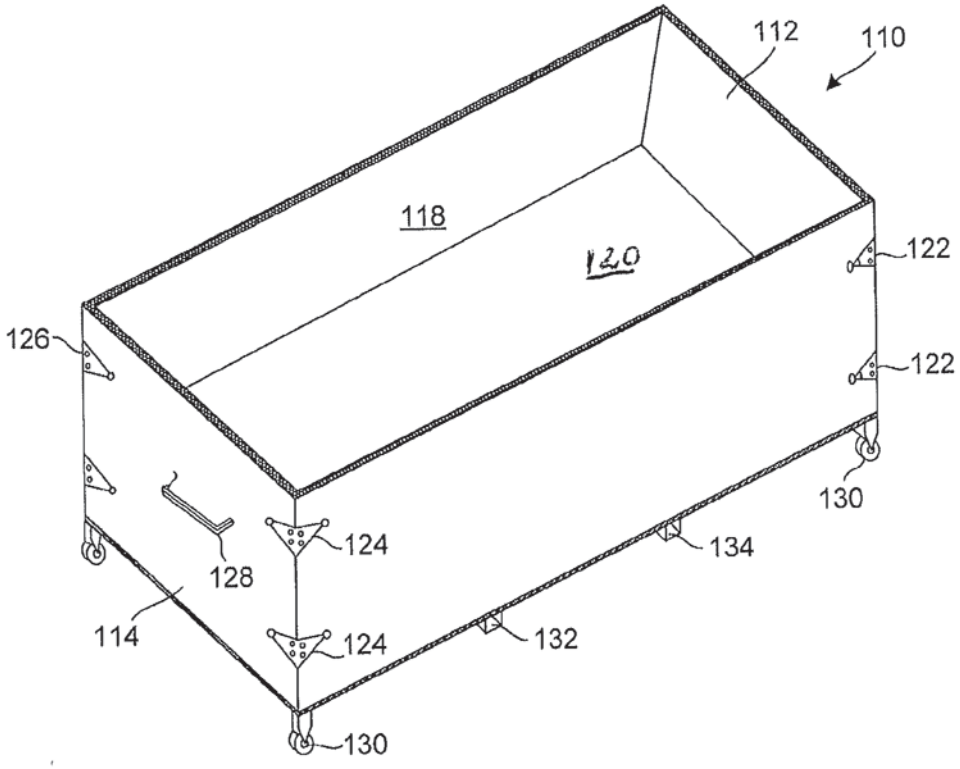



FIG. 7

# PROPPANT STORAGE VESSEL AND ASSEMBLY THEREOF

## CROSS-REFERENCE TO RELATED APPLICATIONS

The present application is a continuation-in-part of U.S. application Ser. No. 13/660,840, filed on Oct. 25, 2012, and entitled "Proppant Storage Vessel and Assembly Thereof", presently pending. U.S. application Ser. No. 13/660,840 is a continuation of U.S. application Ser. No. 13/332,937, filed on Dec. 21, 2011, and entitled "Proppant Storage Vessel and Assembly Thereof", presently pending.

## STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not applicable.

## NAMES OF THE PARTIES TO A JOINT RESEARCH AGREEMENT

Not applicable.

## INCORPORATION-BY-REFERENCE OF MATERIALS SUBMITTED ON A COMPACT DISC

Not applicable.

## BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to storage containers. More particularly, the present invention the relates to storage container assemblies whereby a product in one container can flow to an interior volume of a lower container. Additionally, the present invention relates to containers that are suitable for the transport, storage and dispensing of proppants therefrom.

2. Description of Related Art Including Information Disclosed Under 37 CFR 1.97 and 37 CFR 1.98.

Hydraulic fracturing is the propagation of fractions in a rock layer caused by the presence of pressurized fluid. Hydraulic fractures may form naturally, in the case of veins or dikes, or may be man-made in order to release petroleum, natural gas, coal seam gas, or other substances for extraction. Fracturing is done from a wellbore drilled into reservoir rock formations. The energy from the injection of a highly-pressurized fracking fluid creates new channels in the rock which can increase the extraction rates and ultimate recovery of fossil fuels. The fracture width is typically maintained after the injection by introducing a proppant into the injected fluid. Proppant is a material, such as grains of sand, ceramic, or other particulates, that prevent the fractures from closing when the injection is stopped.

With the rise of hydraulic fracturing over the past decade, there is a steep climb in proppant demand. Global supplies are currently tight. The number of proppant suppliers worldwide has increased since 2000 from a handful to well over fifty sand, ceramic proppant and resin-coat producers.

By the far the dominant proppant is silica sand, made up of ancient weathered quartz, the most common mineral in the Earth's continental crust. Unlike common sand, which often feels gritty when rubbed between the fingers, sand used as a proppant tends to roll to the touch as a result of its round, spherical shape and tightly-graded particle distribution. Sand quality is a function of both deposit and processing. Grain



size is critical, as any given proppant must reliably fall within certain mesh ranges, subject to downhole conditions and completion design. Generally, coarser proppant allows the higher flow capacity due to the larger pore spaces between grains. However, it may break down or crush more readily under stress due to the relatively fewer grain-to-grain contact points to bear the stress often incurred in deep oil- and gas-bearing formations.

Typically, in any hydraulic fracturing operation, a large amount of such proppant is required. Typically, it has been difficult to effectively store the proppant at the fracturing sites. Additionally, it has been found to be rather difficult to effectively transport the proppant to the desired location. Often, proppant is hauled to the desired locations on the back of trucks and is dumped onsite. Under such circumstances, the proppant is often exposed to adverse weather conditions. This will effectively degrade the quality of the proppant during its storage. Additionally, the maintenance of proppant in containers at the hydraulic fracturing site requires a large capital investment in storage facilities. Typically, the unloading of such storage facilities is carried out on a facility-by-facility basis. As such, there is a need to be able to effectively transport the proppant to and store the proppant in a desired location adjacent to the hydraulic fracturing location.

In the past, various patents have issued relating to storage and transport facilities. For example, U.S. Patent Publication No. 2008/0179054, published on Jul. 31, 2008 to McGough et al., shows a bulk material storage and transportation system. In particular, the storage system is mounted on the trailer of a truck. The storage system includes walls that define an interior volume suitable for receiving the aggregate material therein. There are hoppers provided at the bottom of the container. These hoppers have inclined walls. The hoppers can extend so as to allow the material from the inside of the container to be properly conveyed to a location exterior of the container. Actuators are used so as to expand and collapse the container.

U.S. Pat. No. 7,240,681, issued on Jul. 10, 2007 to L. Saik, describes a trailer-mounted mobile apparatus for dewatering and recovering formation sand. The trailer is mounted to a truck-towable trailer so as to receive sand therein. The container has a pair of sloping end walls. The back end of the container is suitably openable so as to allow the sand to be removed therefrom. A pneumatic or hydraulic ram is provided on the forward part of the container so as to allow the container to be lifted angularly upwardly so as to allow sand to be discharged through the gate at the rear of the container.

U.S. Pat. No. 4,247,228, issued on Jan. 27, 1981 to Gray et al., describes a dump truck or trailer with a pneumatic conveyor. The container is mounted to a frame on wheels. A hydraulic ram tilts the container for dumping through a rear outlet. A pneumatic conveyor is carried by the frame with an intake at the rear of the container. A gate allows the solids to be dumped conventionally by gravity or to be blown to a storage facility by the pneumatic container. The container has a top hatch formed therein so as to allow the solids to be introduced into the interior of the container.

U.S. Pat. No. 2,865,521, issued on Dec. 23, 1958 to Fisher et al., shows a bulk material truck that has an interior volume suitable for the receipt of bulk material therein. A pneumatic conveyer is utilized so as to allow the removal of such material from the bottom of the container. A pair of sloping walls are provided on opposite sides of the container so as to allow the bulk material within the container to be passed toward the bottom of the container. A top hatch is provided on the top of the conveyer. The pneumatic conveyer is connected to the bottom of the container.

It is an object of the present invention to provide a proppant storage vessel that allows proppant to be easily transported and stored.

It is another object of the present invention to provide a proppant storage vessel that allows the proppant that is contained within the storage vessel to be easily and efficiently discharged through the bottom thereof.

It is another object of the present invention to provide a proppant storage assembly which allows for the effective storage of proppant a the fracturing site.

It is another object of the present invention to provide a proppant storage assembly which allows proppant to be efficiently removed from a stacked configuration of containers.

These and other objects and advantages of the present invention will become apparent from a reading of the attached specification and appended claims.

## BRIEF SUMMARY OF THE INVENTION

The present invention is a proppant storage vessel that comprises a container having a first end wall, a second end wall, a first side wall and a second side wall. The container also has a top wall and a bottom wall which serve to define an interior volume therein. A hatch is formed on the bottom wall of the container. The bottom hatch is movable between an open position and a closed position. A first inclined surface is positioned in the interior volume. The first inclined surface extends from the first end wall to the bottom hatch. A second inclined surface extends from the second end wall toward the bottom hatch. A third inclined surface extends from the first side wall toward the bottom hatch. A fourth inclined surface extends from the second side wall toward the bottom hatch. The walls have a rigidity suitable for containing at least 30,000 pounds of proppant therein. The container can have up to 100,000 pounds of proppant therein.

A top hatch formed on the top wall. The top hatch is movable between an open position and a closed position.

Each of the first and second end walls and the first and second side walls have a middle. The first inclined surface has an upper end affixed to the first end wall below the middle thereof. The second inclined surface has an upper end affixed to the second end wall below the middle thereof. The third inclined surface has an upper end affixed to the first side wall below the middle thereof. The fourth inclined surface has an upper end thereof affixed to the second side wall below the middle thereof.

A first support brace is affixed to the first and second end walls and extends therebetween. A second support brace is affixed to the first and second side walls and extends therebetween. A first support member has one end affixed to the bottom wall and extends angularly upwardly. The first support member has an opposite end affixed centrally to the first inclined surface. A second support member has one end affixed to the bottom wall and extends angularly upwardly therefrom. The second support member has an opposite end affixed centrally to the second inclined surface. Each of the first, second, third and fourth inclined surfaces has a bottom edge positioned adjacent a perimeter of the bottom hatch. The bottom hatch is hingedly affixed to the bottom wall. The bottom hatch resides against the bottom wall when in the closed position.

The present invention is also a proppant storage assembly that comprises a first container having an interior volume and a second container supported in spaced relation above the first container. The first container has a bottom wall having a bottom hatch affixed thereto. The hatch is movable between an open position and a closed position. The first container has an opening at a top wall thereof. The second container has bottom hatch formed on a bottom wall thereof. The bottom hatch of the second container is aligned with the opening of the first container such that a proppant in the first container can flow through the hatch thereof into the interior volume of the first container.

In particular, the first container has a top hatch hingedly affixed at the opening thereof. The top hatch of the first container is movable between a closed position and an open position. The bottom hatch of the second container has a length dimension. The length dimension is slightly less than a distance between the first container and the second container. The top hatch of the first container extends in parallel relation to the bottom hatch of the second container when each of the top hatch of the first container and the bottom hatch of the second container are in the open position.

A first spacer is positioned on the top wall of the first container and extends upwardly therefrom. The first spacer abuts the bottom wall of the second container. A second spacer is positioned on the top wall of the first container and extends upwardly therefrom. The second spacer abuts the bottom wall of the second container. The first spacer is in spaced relation to the second spacer. A pad is positioned against the bottom wall of the first container. The pad supports the bottom wall of the first container a desired distance above an underlying surface. The bottom hatch of the first container has a length dimension. This length dimension is less than a desired distance between the bottom wall and the underlying surface. As such, a portable conveyer can be placed thereunder. The portable container has a surface positioned between the bottom wall of the first container and the underlying surface. The surface of the portable container is directly below the bottom hatch of the first container.

Each of the first and second containers has a first end wall, a second end wall, a first side wall and a second side wall. A first inclined surface is positioned in the interior volume of the container so as to extend from the first end wall toward the bottom hatch. A second inclined surface is positioned in the interior volume of the container so as to extend from the second end wall toward the bottom hatch. A third inclined surface is positioned in the interior volume so as to extend from the first side wall toward the bottom hatch. A fourth inclined surface is positioned in the interior volume so as to extend from the second side wall toward the bottom hatch.

A third container can be supported in spaced relation above the second container. The second container has a top hatch formed on a top wall thereof. The third container has a bottom hatch formed on a bottom wall thereof. The bottom hatch of the third container is aligned with the top hatch of the second container. Each of the containers is ocean freight container.

In an alternative embodiment of the present invention, the first container has the first side wall, a second side wall, a first end wall and second end wall hingedly mounted to the bottom wall thereof. A first slot and a second slot are affixed to the bottom wall of the container. The first and second slots are suitable for the receipt of forks of a forklift therein.

The foregoing Summary of the Invention is intended to describe, in summary, the preferred embodiments of the present invention. However, this section is not intended, in any way, to limit the scope of the present invention. The scope of the present invention should be defined by the claims herein and their legal equivalents.

## BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

FIG. **1** is a side elevational view of the proppant storage assembly in accordance with the preferred embodiment of the present invention.

FIG. **2** is an end view of the proppant storage assembly of the present invention showing, in particular, the portable conveyer located at a bottom thereof.

FIG. **3** is a transparent plan view of the proppant storage container in accordance with the preferred embodiment of the present invention.

FIG. **4** is a plan view showing of the proppant storage container of the present invention.

FIG. **5** is a cross-sectional view as taken from an end of the proppant storage container of the present invention.

FIG. **6** is cross-sectional view as taken across a side of the proppant storage container of the present invention.

FIG. **7** is a perspective view of an alternative embodiment of the proppant storage container of the present invention.

## DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. **1**, there is shown the proppant storage assembly **10** in accordance with the preferred embodiment of the present invention. The proppant storage assembly **10** includes a first container **12** having an interior volume **14** and a second container **16** having a interior volume **18**. The first container **12** is in spaced relationship to the second container **16**. The first container **12** has a bottom wall **20**. The bottom wall **20** has a bottom hatch **22** affixed thereto. The hatch **22** is movable between a closed position and an open position (illustrated in broken line fashion). The first container **12** has an opening **24** at a top wall **26** thereof. The second container **16** has a hatch **28** formed on a bottom wall **30** thereof. The bottom hatch **28** of the second container **16** is shown as aligned with the opening **26** of the first container **12** such that a proppant within the second container **16** can flow through the hatch **28** into the interior volume **14** of the first container **12**.

In particular, in FIG. **1**, it can be seen that the first container **12** has a hatch **32** extending over the opening **24** thereof. In particular, the hatch **32** is hingedly mounted to the top wall **26** of the first container **12** so as to be movable between a closed position and an open position (illustrated in broken-line fashion). In particular, the bottom hatch **28** of the second container **16** will extend downwardly perpendicularly to the bottom wall **30**. Similarly, the top hatch **32** of the first container **12** will extend upwardly in generally transverse relationship to the top wall **26**. The hatches **28** and **32** will be in generally parallel relationship in this configuration. As such, the hatches **24** and **28** will form a unique and guided flowpath whereby the proppant in the interior volume **18** of the second container **16** can flow directly into the opening **24** and into the interior volume **14** of the first container **12**. The length dimension of the hatches **28** and **32** will be less than the distance between the top wall **26** of the first container **12** and the bottom wall **30** of the second container **16**.

A first spacer **34** is positioned on the top wall **26** of the first container **12** and extends upwardly therefrom. The first spacer **34** abuts the bottom wall **30** of the second container **16**. A second spacer **36** is positioned on the top wall **26** of the first container **12** and extends upwardly therefrom. The second spacer **36** abuts the bottom wall **30** of the second container **16**. The first spacer **34** is in spaced relationship to the second spacer **36**. The spacers **34** and **36** serve to assure a proper distance between the containers **12** and **16** whereby the hatches **28** and **32** can be properly opened so as to allow for the flow of proppant therebetween. A pad **38** is positioned against the bottom wall **20** of the first container **12**. The pad **38** serves to support the first container **12** above an underlying surface **40** (such as the earth). It can be seen that the pad **38** is in the nature of a concrete structure that has a base **42** embedded into the earth. As such, the pad **38** is configured so as to rigidly support the containers **12** and **16** in their desired positions above the earth.

Pad **38** support the container **12** in a suitable distance above the underlying surface **40** such that the hatch **22** can move from its closed position to its open position while allowing a certain amount of space therebetween. As a result, a portable conveyer can be placed below the bottom hatch **22** so as to allow the proppant within the interior volume **14** to be discharged therefrom.

A third container **44** is supported in spaced relationship above the top wall **46** of the second container **16**. As can be seen, the third container has a bottom hatch **48** located on the bottom wall **50** thereof. The top wall **46** has a top hatch **52** hingedly connected thereto. As a result, when the bottom hatch **48** is opened and the top hatch **52** is opened (as illustrated in broken-line fashion), the proppant within the interior volume **54** of the third container **44** can flow directly into the interior volume **18** of the second container **16**. Suitable spacers **56** serve to support the bottom wall **50** of the third container **44** a proper distance above the top wall **46** of the second container **16**. Third container **44** also has a top hatch **58** that is movable between a closed position and an open position (illustrated in broken-line fashion).

In the configuration shown in FIG. **1**, volumes of proppants can be easily stored at the fracturing site. It is only necessary to stack each of the containers **12**, **16** and **44** upon one another in the manner described in FIG. **1**. Each of the containers **12**, **16** and **44** has an exterior configuration similar to that of an ocean freight container. As such, these containers can be easily transported on the bed of a truck, on a freight train or on a ship to the desired location. Because of this stacking arrangement, special proppant storage facilities are not required at the fracturing site. Each of the hatches **28**, **32**, **48**, **52** and **58** can be in a liquid-tight sealing relationship over the respective openings thereof when in the closed position. As such, the arrangement illustrated in FIG. **1** of the proppant storage assembly **10** can avoid any liquid intrusion into the proppant contained within each of the containers **12**, **16** and **44**. Typically, a forklift, or other lifting device, can be utilized so as to properly stack the containers. Within the concept of the present invention, two containers, three containers, or more can be utilized in the construction of the proppant storage assembly **10**. Each of the containers **12**, **16** and **44** has an interior structure in the nature illustrated in FIGS. **3-6** herein, as will be described hereinafter. The present invention provides a suitably modular arrangement whereby a proppant storage facility can be easily constructed on-site. After the fracturing operation is completed, the containers can be easily removed from this stacked configuration and transported to another location. Similarly, if desired, the containers **12**, **16** and **44** can be suitably replaced by another container so as to provide the desired proppant to the fracturing site.

FIG. **2** shows an end view of the proppant storage assembly **10** of the present invention showing of the present invention. In FIG. **2**, it can be seen that the first container **12** is spaced from the second container **16**. The second container **16** is suitably spaced from the third container **44**. The bottom hatch **22** of the first container is openable so that the proppant within the first container **12** can be discharged through the hatch **22** onto a portable conveyer **60**. The portable conveyer **60** can be easily transported to a location below the hatch **22** of the first container **12** so as to allow the proppant from the containers to be transported to another location. Each of the containers **12**, **16** and **44** is vertically aligned in a stacked orientation. The first container has a capacity for storing 100,000 pounds of proppant. The second container **16** and the third container **44**

can store 30,000 pounds of proppant. As such, a very large amount of proppant can be provided to the fracturing site, in a simple easy and convenient manner.

FIG. **3** illustrates the interior construction of the first container **12**. The top wall of the first container **12** has been removed for the purposes of illustration. The container **12** has a first end wall **70**, a second end wall **72**, a first side wall **74** and a second side wall **76**. The end walls **70** and **72** extend between the side walls **74** and **76** so as to define the interior volume of the first container **12**. A first inclined surface **78** extends from the first end wall **70** to the bottom hatch **22**. A second inclined surface **80** extends from the second end wall **72** toward the bottom hatch **22**. A third inclined surface **82** extends from the first side wall **74** toward the bottom hatch **22**. Similarly, a fourth inclined surface **84** extends from the second side wall **76** toward the bottom hatch **22**. Lower ends of each of the inclined surface **78**, **80**, **82** and **84** are aligned with the perimeter of the bottom hatch **22**. The inclining of the side walls **78**, **80**, **82** and **84** serves to assure that the proppant contained within the interior volume thereof is suitably funneled toward the bottom hatch **22**. Each of the inclined surface **78**, **80**, **82** and **84** is has a smooth surface so that a constant flow of proppant can occur.

FIG. **4** illustrates the bracing associated with the first container **12** so as to assure the structural integrity of the container. As can be seen, a first support brace **90** is affixed to the first end wall **70** and extends across the interior volume of the container **12** to the second end wall **72**. The first support brace **90** is suitably welded to the end walls **70** and **72** so as to provide a rigid structural support therebetween. A second support brace **92** has one end affixed to the side wall **74** and an opposite end affixed to the side wall **76**. The second support brace **92** extends transversely to the first support brace **90**. The second support brace **92** provides a rigid support for the side walls **74** and **76**. The first support brace **90** and the second support brace **92** structurally enhance the strength of the container **12** so as to as to withstand the weight of the proppant that is contained therein. The second support brace **92** can also include another support brace **94** extending between the side walls **74** and **76** in generally parallel relationship to the first support brace **90**. Within the concept of the present invention, various other support braces, in the nature of angle irons, can be utilized so as to suitably support the structure of the container **12**.

FIG. **5** illustrates a cross-sectional view of the container **12**. As can be seen, the container **12** has the bottom hatch **22** located on the bottom wall **20** thereof. A top hatch **32** is hingedly mounted to the top wall **26** thereof. Hatch **32** serves to cover the opening **24** in the top wall **26**. The bottom hatch **22** is hingedly mounted to the bottom surface of the bottom wall **20** and can be suitably latched to the bottom wall **20** so as to retain the proppant **100** therein. The container **12** has its side walls **74** and **76** extending vertically upwardly from the bottom wall **20**. The first inclined surface **78** and the second inclined surface **80** are illustrated as funneling the proppant **100** toward the bottom hatch **22**. The first inclined surface **78** has one end mounted adjacent to hatch **22** and an opposite end affixed to the side wall **74**. In particular, the inclined surface **78** has its opposite end at the side wall **74** located below the middle of the side wall **74**. Similarly, the second inclined surface **80** extends from the hatch **22** toward the side wall **76** at a location below the middle of the side wall **76**. The second support brace **92** is illustrated as extending across the interior volume **14** of the first container **12** between the side walls **74** and **76**.

FIG. **6** shows another cross-sectional view of the first container **12**. First container **12** is illustrated also as having the top hatch **32** hingedly mounted to the top wall **26** and the bottom hatch **22** hingedly mounted to the bottom wall **20**. The third inclined surface **82** extends from the bottom hatch **22** to the side wall **74**. The fourth inclined surface **84** extends from the bottom hatch **22** toward the side wall **76**. Each of the ends of the inclined surfaces **82** and **84** will joined to the respective walls **74** and **76** at a location below the middle of each of the side walls **74** and **76**. The first support brace **90** extends between the side walls **74** and **76** so as to provide structural integrity.

In FIG. **6**, there is a first support member **102** that extends from the bottom wall **20** upwardly toward a location centrally of the third inclined surface **82**. Another support member **104** extends from the bottom wall **20** upwardly toward a center of the fourth inclined surface **84**. These support members **102** and **104** enhance the strength of the inclined surface **82** and **84** so as to withstand the weight and forces imparted thereto by the proppant **100**.

FIG. **7** shows an alternative embodiment of the container **110** of the present invention. Container **110** includes a first end wall **112**, a second end wall **114**, a first side wall **116**, and a second side wall **118**. Each of the end walls **112** and **114** and each of the side walls **116** and **118** are illustrated as extending upwardly from a bottom wall **120**.

Within concept shown in FIG. **7**, each of the end walls **112** and **114** and each of the side walls **116** and **118** are hingedly mounted to the bottom wall **120**. It can be seen that there are latch members **122**, **124** and **126** that serve to secure the walls **112**, **114**, **116** and **118** in their upright configuration. Latch members **122** join the side wall **116** to the end **112**. Latch members **124** join the side wall **116** to the end walls **114**. Latch members **126** secure the end wall **114** to the side walls **118**. An additional latch member (not illustrated) will secure the end wall **112** to the side wall **118**. As such, the structure of the container **110** can be in a sand-receiving orientation.

Importantly, since each of the walls **112**, **114**, **116** and **118** are hingedly secured to the bottom wall **120**, the walls can be pivoted about the hinges so as to overlie the bottom **112** once the latch members **122**, **124** and **126** are released. A handle **128** is provided on the end walls **112** and **114** so as to allow the container **110** to be moved, as desired. Wheels **130** extend downwardly from the bottom wall **120** so as to allow the container **110** to be rolled to a desired position.

In FIG. **7**, there is first slot **132** and a second slot **134** formed on the bottom of the bottom surface **120**. Slots **132** and **134** allow for the receipt of the forks of a forklift therein. As such, the container **110** can be moved to a desired location in a simple and efficient manner.

The foregoing disclosure and description of the invention is illustrative and explanatory thereof. Various changes in the details of the illustrated construction can be made within the scope of the appended claims without departing from the true spirit of the invention. The present invention should only be limited by the following claims and their legal equivalents.

I claim:

**1**. A proppant storage system for use with hydraulic fracturing operations, the system comprising:

a container comprising;

a cavity;

sidewalls that define a lateral periphery of the cavity;

a plurality of support braces affixed to the sidewalls and which define structural support for the sidewalls;

inclined surfaces that define a lower periphery of the cavity, and that depend axially away and extends inwardly from the sidewalls with lateral distance from the sidewalls to define an inclined lower periphery surface;

a bottom;

support members that extend between the bottom and inclined surfaces;

a hatch positioned closely adjacent to the bottom and selectively moveable to an open configuration so that when proppant is positioned in the cavity and comprises particles that have a substantially spherical shape and a tightly graded particle distribution, the proppant readily slides down the inclined surface to the open configuration of the hatch and from within the cavity to a location outside of the cavity and moveable to a closed configuration of the hatch with the hatch aligned with lower ends of the inclined surfaces thereby to block a flow of the proppant from within the cavity, the hatch circumscribed by the sidewalls when the hatch is in the open configuration; and

an opening to the cavity that registers with the hatch.

**2**. The proppant storage system of claim **1**, wherein the container comprises a modular upper container, the proppant storage system further comprising a modular lower container having sidewalls, a cavity formed within the sidewalls, and an opening to the cavity, and wherein the upper container is stacked on the lower container.

**3**. The proppant storage system of claim **2**, wherein when the hatch is selectively opened to the open configuration the proppant when positioned in the container readily flows from the cavity in the upper container into the cavity in the lower container.

**4**. The proppant storage system of claim **2**, further comprising a multiplicity of containers stacked axially on the upper container, and proppant in each of the multiplicity of containers.

**5**. The proppant storage system of claim **4**, further comprising one or more spacers positioned between each of the multiplicity of containers for maintaining a space between adjacent containers.

**6**. The proppant storage system of claim **1**, wherein the hatch is disposed on the bottom so that all of the proppant in the cavity is gravity feedable through the hatch.

**7**. The proppant storage system of claim **1**, wherein one or more pads extend from the bottom to support the container a suitable distance above an underlying surface so that the hatch moves from a closed to an open configuration.

**8**. The proppant storage system of claim **1**, further comprising an elongated spacer having an end on an upper surface of the container for axially supporting another container that is above the container.

**9**. The proppant storage system of claim **1**, wherein the inclined surfaces include a mid-portion, wherein the support members contact the inclined surfaces along the mid-portion, and wherein the support members are oriented along a path that is oblique to the bottom.

**10**. The proppant storage system of claim **1**, wherein the lower inclined surface peripheries angle downwardly from the sidewalls at an angle having a value selected from the group consisting of about 26°, about 28°, and about 35°.

**11**. The proppant storage system of claim **1**, further comprising one or more pads that extend axially away from the bottom in a direction opposite the inclined surfaces and which define a support structure for the container, wherein the pads are elongated members that have a distal bottom end that mounts in a base, and wherein the base is embedded in the surface on which the container is supported.

**12**. The proppant storage system of claim **1**, wherein the container comprises an exterior configuration substantially similar to that of an ocean freight container.

**13**. The proppant storage system of claim **1**, wherein the sidewalls have a rigidity suitable for retaining no less than about 30,000 pounds of proppant when positioned therein.

**14**. The proppant storage system of claim **1**, wherein the proppant material when positioned therein further has a weight being up to about 100,000 pounds of proppant.

**15**. The proppant storage system of claim **1**, further comprising a liquid tight seal associated with the hatch and the opening.

* * * * *

# EXHIBIT B

US009403626B2

(12) **United States Patent**
**Oren**

(10) **Patent No.: US 9,403,626 B2**
(45) **Date of Patent: Aug. 2, 2016**

(54) **PROPPANT STORAGE VESSEL AND ASSEMBLY THEREOF**

(71) Applicant: **Oren Technologies, LLC**, Houston, TX (US)

(72) Inventor: **John Oren**, Houston, TX (US)

(73) Assignee: **OREN TECHNOLOGIES, LLC**, Houston, TX (US)

( * ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/831,905**

(22) Filed: **Aug. 21, 2015**

(65) **Prior Publication Data**

US 2015/0368038 A1 Dec. 24, 2015

**Related U.S. Application Data**

(63) Continuation of application No. 13/949,693, filed on Jul. 24, 2013, now Pat. No. 9,296,518, which is a continuation-in-part of application No. 13/660,840, filed on Oct. 25, 2012, now Pat. No. 8,505,780, and a continuation of application No. 13/332,937, filed on Dec. 21, 2011, now Pat. No. 8,827,118.

(51) **Int. Cl.**

| | |
|---|---|
| ***B65D 88/54*** | (2006.01) |
| ***B65D 25/08*** | (2006.01) |
| ***B65D 88/32*** | (2006.01) |

(Continued)

(52) **U.S. Cl.**

CPC ..... ***B65D 25/08*** (2013.01); ***B65D 88/022*** (2013.01); ***B65D 88/32*** (2013.01); ***B65D 88/542*** (2013.01); ***B65D 90/02*** (2013.01); ***B65D 90/12*** (2013.01); ***B65D 90/14*** (2013.01); ***B65G 65/40*** (2013.01)

(58) **Field of Classification Search**

CPC ..... B65D 88/022; B65D 90/02; B65D 90/12; B65G 65/40

USPC ..... 220/601, 23.83; 414/304, 408; 222/185.1, 143, 184, 460, 462

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

| | | |
|---|---|---|
| 137,871 A | 4/1873 | Worsley |
| 150,894 A | 5/1874 | Safely |

(Continued)

FOREIGN PATENT DOCUMENTS

| | | |
|---|---|---|
| DE | 3108121 | 9/1982 |
| DE | 3342281 | 6/1985 |

(Continued)

OTHER PUBLICATIONS

SandBox Logistics, "Mine to Wellhead Logistics," Houston, TX, May 2013.

(Continued)

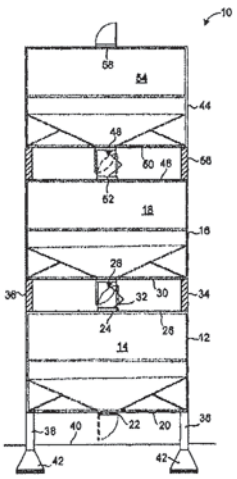
*Primary Examiner* — Donnell Long

(74) *Attorney, Agent, or Firm* — Hogan Lovells US LLP

(57) **ABSTRACT**

A proppant storage vessel has a container having a first end wall, a second end wall, a first side wall, a second side wall, a top wall and a bottom wall. The first and second end walls extend between opposite ends of the first and second side walls. The walls define an interior volume of the container. The walls have a rigidity suitable for retaining no less than 30,000 pounds of proppant therein. A top hatch is formed centrally on the top wall and is movable between an open position and a closed position. A bottom batch is formed generally centrally on the bottom wall of the container and is movable between an open position and a closed position.

**22 Claims, 4 Drawing Sheets**



(51) **Int. Cl.**

| | |
|---|---|
| ***B65D 90/14*** | (2006.01) |
| ***B65D 88/02*** | (2006.01) |
| ***B65D 90/02*** | (2006.01) |
| ***B65D 90/12*** | (2006.01) |
| ***B65G 65/40*** | (2006.01) |

(56) **References Cited**

U.S. PATENT DOCUMENTS


| | | | |
|---|---|---|---|
| 384,443 | A | 6/1888 | Hoover |
| 448,238 | A | 3/1891 | Johnson |
| 711,632 | A | 10/1902 | Johnson |
| 1,143,641 | A | 6/1915 | McGregor |
| 1,331,883 | A | 2/1920 | Stuart |
| 1,344,768 | A | 6/1920 | Messiter |
| 1,434,488 | A | 11/1922 | Forsythe et al. |
| 1,520,560 | A | 12/1923 | Burno |
| 1,506,936 | A | 9/1924 | Lea |
| 1,526,527 | A | 2/1925 | Butler |
| 1,573,664 | A | 2/1926 | Wetherill |
| 1,850,000 | A | 3/1932 | Fernand |
| 1,973,312 | A | 9/1934 | Hardinge |
| 2,233,005 | A | 2/1941 | Garlinghouse |
| 2,293,160 | A | 8/1942 | Miller et al. |
| 2,368,672 | A | 2/1945 | McNamara |
| 2,564,020 | A | 8/1951 | Mengel |
| 2,616,758 | A | 11/1952 | Meyers |
| 2,622,771 | A | 12/1952 | Tulou |
| 2,652,174 | A | 9/1953 | Shea et al. |
| 2,865,521 | A | 12/1958 | Fisher et al. |
| 2,894,666 | A | 7/1959 | Campbell, Jr. |
| 3,049,248 | A | 8/1962 | Heltzel et al. |
| 3,064,832 | A | 11/1962 | Heltzel |
| 3,083,879 | A | 4/1963 | Coleman |
| 3,090,527 | A | 5/1963 | Rensch |
| 3,163,127 | A | 12/1964 | Gutridge et al. |
| 3,199,585 | A | 8/1965 | Cronberger |
| 3,248,026 | A | 4/1966 | Kemp |
| 3,270,921 | A | 9/1966 | Nadolske et al. |
| 3,281,006 | A | 10/1966 | Wei |
| 3,294,306 | A | 12/1966 | Areddy |
| 3,318,473 | A | 5/1967 | Jones et al. |
| 3,353,599 | A | 11/1967 | Swift |
| 3,378,152 | A | 4/1968 | Warner |
| 3,387,570 | A | 6/1968 | Pulcrano et al. |
| 3,397,654 | A | 8/1968 | Snyder |
| 3,407,971 | A | 10/1968 | Oehler |
| 3,455,474 | A | 7/1969 | Truncali |
| 3,528,570 | A | 9/1970 | Pase |
| 3,561,633 | A | 2/1971 | Morrison et al. |
| 3,587,834 | A | 6/1971 | Dugge |
| 3,601,244 | A | 8/1971 | Ort et al. |
| 3,602,400 | A | 8/1971 | Cooke |
| 3,653,521 | A | 4/1972 | Bridge |
| 3,661,293 | A | 5/1972 | Gerhard et al. |
| 3,721,199 | A | 3/1973 | Hassenauer |
| 3,738,511 | A | 6/1973 | Lemon et al. |
| 3,785,534 | A | 1/1974 | Smith |
| 3,800,712 | A | 4/1974 | Krug, Jr. |
| 3,817,261 | A | 6/1974 | Rogge |
| 3,820,762 | A | 6/1974 | Bostrom et al. |
| 3,986,708 | A | 10/1976 | Hellzel et al. |
| 4,004,700 | A | 1/1977 | Empey |
| 4,063,656 | A | 12/1977 | Lambert |
| 4,138,163 | A | 2/1979 | Calvert et al. |
| 4,178,117 | A | 12/1979 | Brugler |
| 4,204,773 | A | 5/1980 | Bates |
| 4,210,273 | A | 7/1980 | Hegele |
| 4,210,963 | A | 7/1980 | Ricciardi et al. |
| RE30,358 | E | 8/1980 | Sensibar |
| 4,222,498 | A | 9/1980 | Brock |
| 4,232,884 | A | 11/1980 | DeWitt |
| 4,239,424 | A | 12/1980 | Pavolka |
| 4,247,228 | A | 1/1981 | Gray et al. |
| 4,265,266 | A | 5/1981 | Kierbow et al. |
| 4,282,988 | A | 8/1981 | Hulbert, Jr. |
| 4,350,241 | A | 9/1982 | Wenzel |
| 4,359,176 | A | 11/1982 | Johnson |
| 4,363,396 | A | 12/1982 | Wolf et al. |
| 4,397,406 | A | 8/1983 | Croley |
| 4,398,653 | A | 8/1983 | Daloisio |
| 4,402,392 | A | 9/1983 | Fabian et al. |
| 4,407,202 | A | 10/1983 | McCormick |
| 4,408,886 | A | 10/1983 | Sampson et al. |
| 4,428,504 | A | 1/1984 | Bassett et al. |
| 4,449,861 | A | 5/1984 | Saito et al. |
| 4,474,204 | A | 10/1984 | West |
| 4,478,155 | A | 10/1984 | Cena et al. |
| 4,532,098 | A | 7/1985 | Campbell |
| 4,608,931 | A | 9/1986 | Ruhmann et al. |
| 4,626,155 | A | 12/1986 | Hlinsky et al. |
| 4,701,095 | A | 10/1987 | Berryman et al. |
| 4,715,754 | A | 12/1987 | Scully |
| 4,738,774 | A | 4/1988 | Patrick |
| 4,741,273 | A | 5/1988 | Sherwood |
| 4,801,389 | A | 1/1989 | Brannon et al. |
| 4,819,830 | A | 4/1989 | Schultz |
| 4,848,605 | A | 7/1989 | Wise |
| 4,882,784 | A | 11/1989 | Tump |
| 4,901,649 | A | 2/1990 | Fehrenbach et al. |
| 4,909,378 | A | 3/1990 | Webb |
| 4,909,556 | A | 3/1990 | Koskinen |
| 4,917,019 | A | 4/1990 | Hesch et al. |
| 4,919,583 | A | 4/1990 | Speakman, Jr. |
| 4,946,068 | A | 8/1990 | Erickson et al. |
| 4,947,760 | A | 8/1990 | Dawson et al. |
| 4,975,205 | A | 12/1990 | Sloan |
| 4,995,522 | A | 2/1991 | Barr |
| 5,004,400 | A | 4/1991 | Handke |
| 5,069,352 | A | 12/1991 | Harbolt et al. |
| 5,102,286 | A | 4/1992 | Fenton |
| 5,105,858 | A | 4/1992 | Levinson |
| 5,131,524 | A | 7/1992 | Uehara |
| 5,199,826 | A | 4/1993 | Lawrence |
| 5,201,546 | A | 4/1993 | Lindsay |
| 5,224,635 | A | 7/1993 | Wise |
| 5,253,776 | A | 10/1993 | Decroix et al. |
| 5,286,158 | A | 2/1994 | Zimmerman |
| 5,320,046 | A | 6/1994 | Hesch |
| 5,373,792 | A | 12/1994 | Pileggi et al. |
| 5,402,915 | A | 4/1995 | Hogan |
| 5,413,154 | A | 5/1995 | Hurst, Jr. et al. |
| 5,429,259 | A | 7/1995 | Robin |
| 5,441,321 | A | 8/1995 | Karpisek |
| 5,470,175 | A | 11/1995 | Jensen et al. |
| 5,538,286 | A | 7/1996 | Hoff |
| 5,564,599 | A | 10/1996 | Barber et al. |
| 5,602,761 | A | 2/1997 | Spoerre et al. |
| 5,613,446 | A | 3/1997 | DiLuigi et al. |
| RE35,580 | E | 8/1997 | Heider et al. |
| 5,687,881 | A | 11/1997 | Rouse et al. |
| 5,690,466 | A | 11/1997 | Gaddis et al. |
| 5,706,614 | A | 1/1998 | Wiley et al. |
| 5,761,854 | A | 6/1998 | Johnson et al. |
| 5,762,222 | A | 6/1998 | Liu |
| 5,782,524 | A | 7/1998 | Heider et al. |
| 5,785,421 | A | 7/1998 | Milek |
| 5,806,863 | A | 9/1998 | Heger et al. |
| 5,836,480 | A | 11/1998 | Epp et al. |
| 5,876,172 | A | 3/1999 | Di Rosa |
| 5,911,337 | A | 6/1999 | Bedeker |
| 5,927,558 | A | 7/1999 | Bruce |
| 5,971,219 | A | 10/1999 | Karpisek |
| 6,002,063 | A | 12/1999 | Bilak et al. |
| 6,069,118 | A | 5/2000 | Hinkel et al. |
| 6,077,068 | A | 6/2000 | Okumura |
| 6,109,486 | A | 8/2000 | Lee |
| 6,120,233 | A | 9/2000 | Adam |
| 6,155,175 | A | 12/2000 | Rude et al. |
| 6,190,107 | B1 | 2/2001 | Lanigan et al. |
| 6,192,985 | B1 | 2/2001 | Hinkel et al. |
| 6,205,938 | B1 | 3/2001 | Foley et al. |
| 6,247,594 | B1 | 6/2001 | Garton |
| 6,283,212 | B1 | 9/2001 | Hinkel et al. |
| 6,306,800 | B1 | 10/2001 | Samuel et al. |

(56) **References Cited**

U.S. PATENT DOCUMENTS

| | | | | |
|---|---|---|---|---|
| 6,328,156 | B1 | 12/2001 | Ostman | |
| 6,328,183 | B1 | 12/2001 | Coleman | |
| 6,364,584 | B1 | 4/2002 | Taylor | |
| 6,401,983 | B1 | 6/2002 | McDonald et al. | |
| 6,415,909 | B1 | 7/2002 | Mitchell et al. | |
| 6,457,291 | B2 | 10/2002 | Wick | |
| 6,508,615 | B2 | 1/2003 | Taylor | |
| 6,537,002 | B2 | 3/2003 | Gloystein | |
| 6,575,614 | B2 | 6/2003 | Tosco et al. | |
| 6,660,693 | B2 | 12/2003 | Miller et al. | |
| 6,675,073 | B2 | 1/2004 | Kieman et al. | |
| 6,720,290 | B2 | 4/2004 | England et al. | |
| 6,772,912 | B1 | 8/2004 | Schall et al. | |
| 6,776,235 | B1 | 8/2004 | England | |
| 6,783,032 | B2 | 8/2004 | Fons | |
| 6,811,048 | B2 | 11/2004 | Lau | |
| 6,828,280 | B2 | 12/2004 | England et al. | |
| 6,835,041 | B1 | 12/2004 | Albert | |
| 6,882,960 | B2 | 4/2005 | Miller | |
| 6,902,061 | B1 | 6/2005 | Elstone | |
| 6,915,854 | B2 | 7/2005 | England et al. | |
| 6,953,119 | B1 | 10/2005 | Wening | |
| 6,955,127 | B2 | 10/2005 | Taylor | |
| 6,968,946 | B2 | 11/2005 | Shuert | |
| 7,084,095 | B2 | 8/2006 | Lee et al. | |
| 7,104,425 | B2 | 9/2006 | Le Roy | |
| 7,140,516 | B2 | 11/2006 | Bothor | |
| 7,214,028 | B2 | 5/2007 | Boasso | |
| 7,240,681 | B2 | 7/2007 | Saik | |
| 7,252,309 | B2 | 8/2007 | Eng Soon et al. | |
| 7,284,579 | B2 | 10/2007 | Elgan et al. | |
| 7,316,333 | B2 | 1/2008 | Wegner | |
| 7,475,796 | B2 | 1/2009 | Garton | |
| 7,513,280 | B2 | 4/2009 | Brashears et al. | |
| 7,753,637 | B2 | 7/2010 | Benedict et al. | |
| 7,802,958 | B2 | 9/2010 | Garcia et al. | |
| 7,837,427 | B2 | 11/2010 | Beckel | |
| 7,921,783 | B2 | 4/2011 | Forbes et al. | |
| 7,967,161 | B2 | 6/2011 | Townsend | |
| 8,083,083 | B1 | 12/2011 | Mohns | |
| 8,201,520 | B2 | 6/2012 | Meritt | |
| 8,313,278 | B2 | 11/2012 | Simmons et al. | |
| D688,351 | S | 8/2013 | Oren | |
| 8,505,780 | B2 | 8/2013 | Oren | |
| 8,585,341 | B1 | 11/2013 | Oren | |
| 8,616,370 | B2 | 12/2013 | Allegretti | |
| 8,622,251 | B2 | 1/2014 | Oren | |
| 8,668,430 | B2 | 3/2014 | Oren | |
| D703,582 | S | 4/2014 | Oren | |
| 8,827,118 | B2 | 9/2014 | Oren | |
| 8,887,914 | B2 | 11/2014 | Allegretti | |
| 2001/0022308 | A1 | 9/2001 | Epp et al. | |
| 2001/0045338 | A1 | 11/2001 | Ransil et al. | |
| 2002/0134550 | A1 | 9/2002 | Leeson et al. | |
| 2002/0139643 | A1 | 10/2002 | Peltier et al. | |
| 2003/0111470 | A1 | 6/2003 | Fouillet et al. | |
| 2004/0065699 | A1 | 4/2004 | Schoer et al. | |
| 2004/0074922 | A1 | 4/2004 | Bothor et al. | |
| 2004/0084874 | A1 | 5/2004 | McDougall et al. | |
| 2004/0118725 | A1 * | 6/2004 | Shuert | B65D 19/0028 206/386 |
| 2004/0206646 | A1 | 10/2004 | Goh | |
| 2004/0245284 | A1 | 12/2004 | Mehus et al. | |
| 2005/0158158 | A1 | 7/2005 | Porta | |
| 2005/0201851 | A1 | 9/2005 | Jonkka | |
| 2006/0180062 | A1 | 8/2006 | Furrer et al. | |
| 2006/0180232 | A1 | 8/2006 | Glewwe et al. | |
| 2006/0239806 | A1 | 10/2006 | Yelton | |
| 2006/0267377 | A1 | 11/2006 | Lusk et al. | |
| 2006/0277783 | A1 | 12/2006 | Garton | |
| 2007/0125543 | A1 | 6/2007 | McNeel et al. | |
| 2007/0210080 | A1 * | 9/2007 | Hooper | B65D 88/121 220/1.5 |
| 2008/0008562 | A1 | 1/2008 | Beckel et al. | |
| 2008/0029546 | A1 | 2/2008 | Shuld | |
| 2008/0029553 | A1 | 2/2008 | Culleton | |
| 2008/0179054 | A1 | 7/2008 | McGough et al. | |
| 2008/0179324 | A1 | 7/2008 | McGough et al. | |
| 2008/0213073 | A1 | 9/2008 | Benedict et al. | |
| 2008/0226434 | A1 | 9/2008 | Smith et al. | |
| 2008/0264641 | A1 | 10/2008 | Slabaugh et al. | |
| 2009/0038242 | A1 | 2/2009 | Cope | |
| 2009/0078410 | A1 | 3/2009 | Krenek et al. | |
| 2010/0021258 | A1 | 1/2010 | Kim | |
| 2010/0038143 | A1 | 2/2010 | Burnett et al. | |
| 2010/0040446 | A1 | 2/2010 | Renyer | |
| 2010/0065466 | A1 | 3/2010 | Perkins | |
| 2011/0011893 | A1 | 1/2011 | Cerny | |
| 2011/0017693 | A1 | 1/2011 | Thomas | |
| 2011/0101040 | A1 | 5/2011 | Weissbrod | |
| 2011/0160104 | A1 | 6/2011 | Wu et al. | |
| 2011/0222983 | A1 | 9/2011 | Dugic et al. | |
| 2012/0219391 | A1 | 8/2012 | Teichrob et al. | |
| 2013/0004272 | A1 | 1/2013 | Mintz | |
| 2013/0022441 | A1 | 1/2013 | Uhryn et al. | |
| 2013/0206415 | A1 | 8/2013 | Sheesley | |
| 2013/0209204 | A1 | 8/2013 | Sheesley | |
| 2013/0233545 | A1 | 9/2013 | Mahoney | |
| 2013/0309052 | A1 | 11/2013 | Luharuka | |
| 2013/0323005 | A1 | 12/2013 | Rexius et al. | |
| 2014/0020765 | A1 | 1/2014 | Oren | |
| 2014/0020892 | A1 | 1/2014 | Oren | |
| 2014/0023465 | A1 | 1/2014 | Oren et al. | |
| 2014/0083554 | A1 | 3/2014 | Harris | |
| 2014/0097182 | A1 | 4/2014 | Sheesley | |
| 2014/0166647 | A1 | 6/2014 | Sheesley | |
| 2014/0203046 | A1 | 7/2014 | Allegretti | |
| 2014/0234059 | A1 | 8/2014 | Thomeer | |
| 2014/0305769 | A1 | 10/2014 | Eiden et al. | |
| 2014/0321950 | A1 | 10/2014 | Krenek et al. | |
| 2015/0069052 | A1 | 3/2015 | Allegretti et al. | |
| 2015/0086307 | A1 | 3/2015 | Stefan | |

FOREIGN PATENT DOCUMENTS

| | | |
|---|---|---|
| EP | 0997607 | 5/2000 |
| EP | 1775190 | 4/2007 |
| GB | 1296736 | 11/1972 |
| JP | S4871029 | 9/1973 |
| JP | S4876041 | 9/1973 |
| JP | S58161888 | 10/1983 |
| JP | 10264882 | 10/1998 |
| WO | 2006039757 | 4/2006 |
| WO | 2010026235 | 3/2010 |
| WO | 2012021447 | 2/2012 |

OTHER PUBLICATIONS

SandBox Logistics, screenshots from video made in Apr. 2013 and publicly shown in May 2013, Arnegard, North Dakota.

International Search Report for PCT/US15/35635, Oct. 30, 2015. (12 pages).

European Search Report for Application No. 15167039.5, Sep. 8, 2015. (7 pages).

International Search Report for related International Application No. PCT/US2012/066639, Feb. 25, 2013.

International Search Report for related International Application No. PCT/US2013/035442, Jun. 23, 2013.

International Search Report for related International Application No. PCT/US2013/032819, May 23, 2013.

International Search Report for related International Application No. PCT/US2013/049028, Mar. 4, 2014.

International Preliminary Report on Patentability for PCT/US2012/066639, Feb. 26, 2013.

International Preliminary Report on Patentability for PCT/US2013/032819, Sep. 23, 2014.

International Search Report for PCT/US2015/012990, dated May 6, 2015. (15 pages).

FS-35 Desert Frac-Sanders. NOV (National Oilwell Varco). Mar. 19, 2012. (https://web.archive.org/web/20120319070423/http://www.nov.com/Well_Service_and_Completion/Frac_Sand_Handling_Equipment/Frac_Sanders/FS-35.aspx).

(56) **References Cited**

OTHER PUBLICATIONS

File History for U.S. Appl. No. 61/538,616, Robert A. Harris, Sep. 23, 2011. (21 pages).
International Search Report for PCT/US2015/024810, Jul. 8, 2015. (13 pages).
PCT International Search Report for PCT/US15/49074, Dec. 17, 2015. (11 pages).
PCT International Search Report for PCT/US15/57601, May 6, 2016. (11 pages).

* cited by examiner

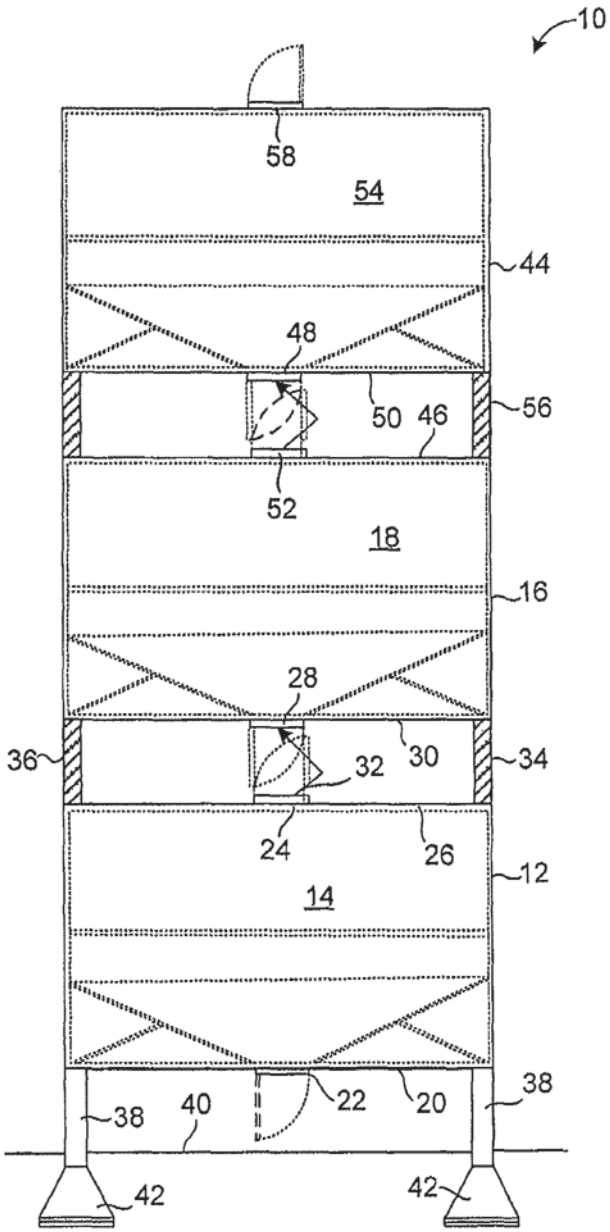



FIG. 1

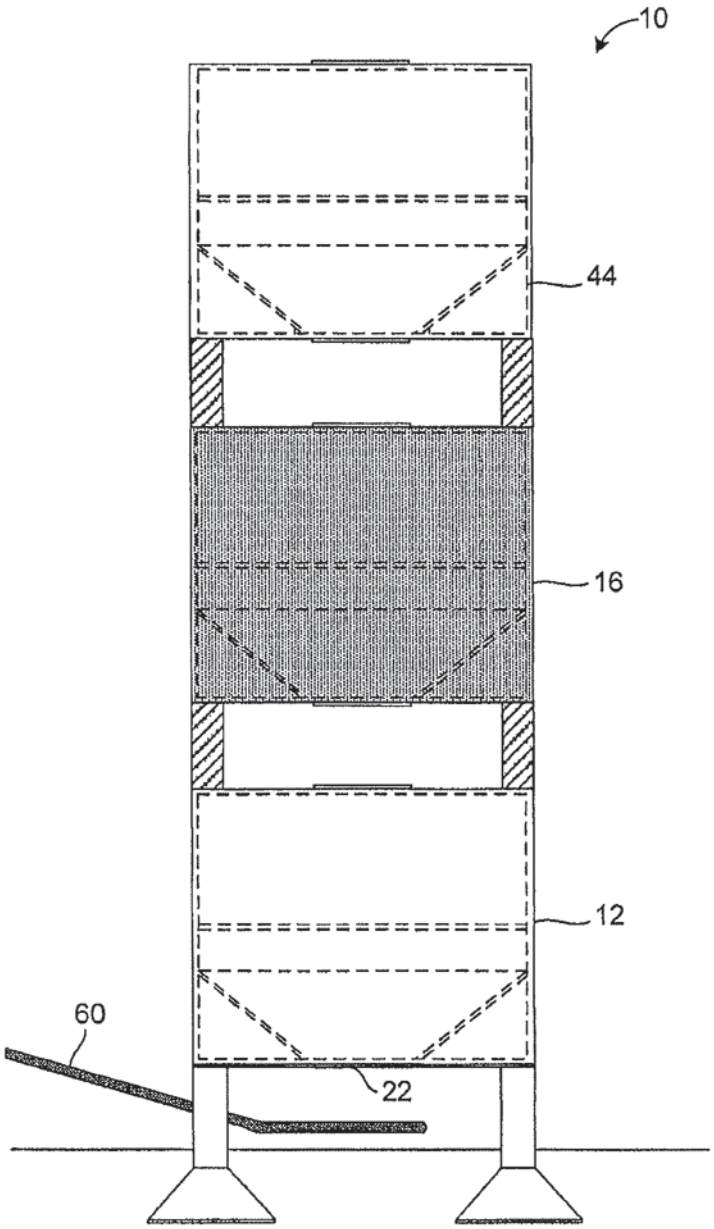



FIG. 2

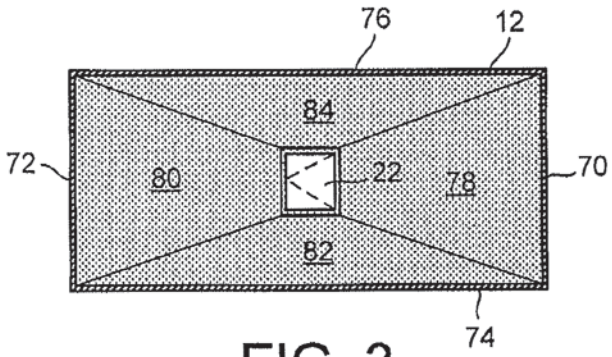



FIG. 3

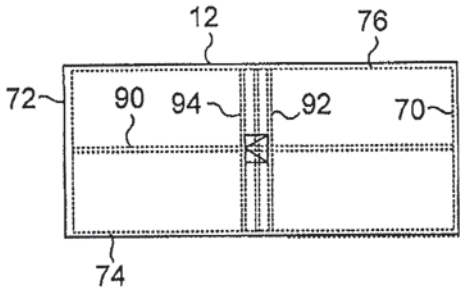



FIG. 4

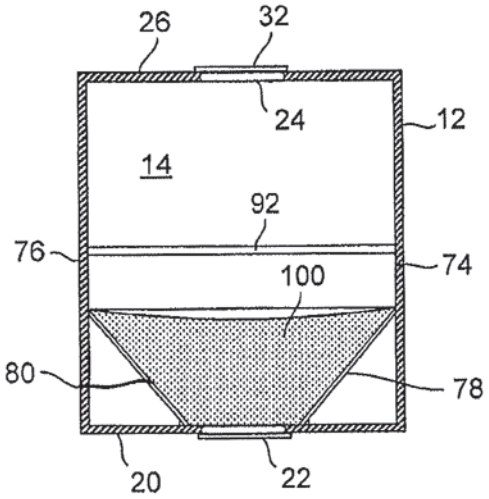



FIG. 5

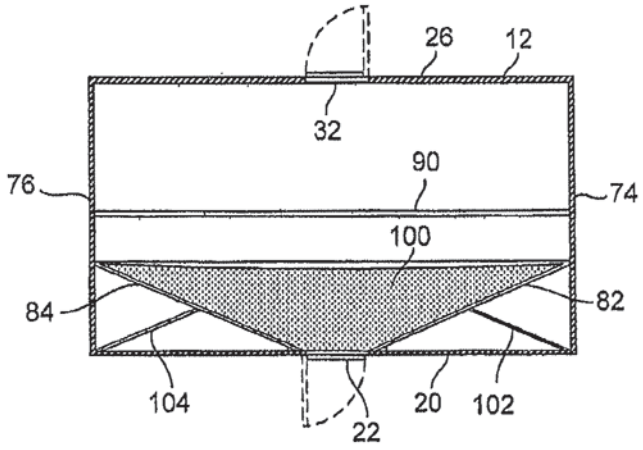



FIG. 6

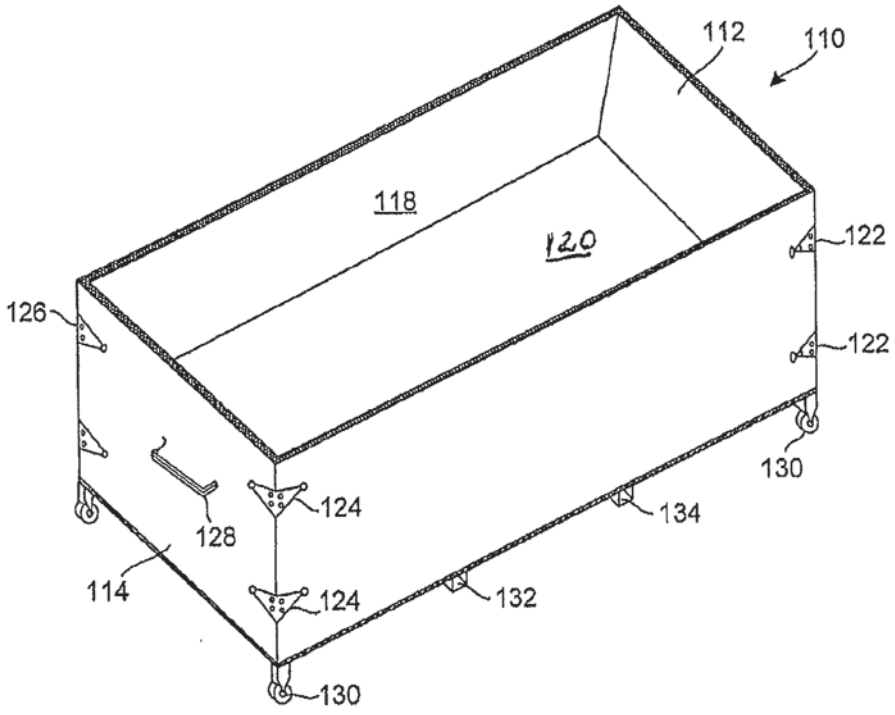



FIG. 7

# PROPPANT STORAGE VESSEL AND ASSEMBLY THEREOF

## RELATED APPLICATIONS

The present application is a continuation of, is related to and claims priority to, and the benefit of, U.S. Non-Provisional application Ser. No. 13/949,693, filed Jul. 24, 2013, titled "Proppant Storage Vessel and Assembly Thereof," which is a continuation-in-part of U.S. Non-Provisional application Ser. No. 13/660,840, filed Oct. 25, 2012, titled "Proppant Storage Vessel and Assembly Thereof," now U.S. Pat. No. 8,505,780, issued Aug. 13, 2013, which is a continuation of U.S. Non-Provisional application Ser. No. 13/332,937, filed Dec. 21, 2011, titled "Proppant Storage Vessel and Assembly Thereof," now U.S. Pat. No. 8,827,118, issued Sep. 9, 2014, each of which are incorporated herein in their entireties by reference.

## BACKGROUND

1. Field of the Invention

The present invention relates to storage containers. More particularly, the present invention relates to storage container assemblies whereby a product in one container can flow to an interior volume of a lower container. Additionally, the present invention relates to containers that are suitable for the transport, storage and dispensing of proppants therefrom.

2. Description of Related Art

Hydraulic fracturing is the propagation of fractions in a rock layer caused by the presence of pressurized fluid. Hydraulic fractures may form naturally, in the case of veins or dikes, or may be man-made in order to release petroleum, natural gas, coal seam gas, or other substances for extraction. Fracturing is done from a wellbore drilled into reservoir rock formations. The energy from the injection of a highly-pressurized hacking fluid creates new channels in the rock which can increase the extraction rates and ultimate recovery of fossil fuels. The fracture width is typically maintained after the injection by introducing a proppant into the injected fluid. Proppant is a material, such as grains of sand, ceramic, or other particulates, that prevent the fractures from closing when the injection is stopped.

With the rise of hydraulic fracturing over the past decade, there is a steep climb in proppant demand. Global supplies are currently tight. The number of proppant suppliers worldwide has increased since 2000 from a handful to well over fifty sand, ceramic proppant and resin-coat producers.

By the far the dominant proppant is silica sand, made up of ancient weathered quartz, the most common mineral in the Earth's continental crust. Unlike common sand, which often feels gritty when Ribbed between the fingers, sand used as a proppant tends to roll to the touch as a result of its round, spherical shape and tightly-graded particle distribution. Sand quality is a function of both deposit and processing Grain size is critical, as any given proppant must reliably fall within certain mesh ranges, subject to downhole conditions and completion design. Generally, coarser proppant allows the higher flow capacity due to the larger pore spaces between grains. However, it may break down or crush more readily under stress due to the relatively fewer grain-to-grain contact points to bear the stress often incurred in deep oil- and gas-bearing formations.

Typically, in any hydraulic fracturing operation, a large amount of such proppant is required. Typically, it has been difficult to effectively store the proppant at the fracturing sites. Additionally, it has been found to be rather difficult to effectively transport the proppant to the desired location. Often, proppant is hauled to the desired locations on the back of trucks and is dumped onsite. Under such circumstances, the proppant is often exposed to adverse weather conditions. This will effectively degrade the quality of the proppant during its storage. Additionally, the maintenance of proppant in containers at the hydraulic fracturing site requires a large capital investment in storage facilities. Typically, the unloading of such storage facilities is carried out on a facility-by-facility basis. As such, there is a need to be able to effectively transport the proppant to and store the proppant in a desired location adjacent to the hydraulic fracturing location.



In the past, various patents have issued relating to storage and transport facilities. For example, U.S. Patent Publication No. 2008/0179054, published on Jul. 31, 2008 to McGough et at, shows a bulk material storage and transportation system. In particular, the storage system is mounted on the trailer of a truck. The storage system includes walls that define an interior volume suitable for receiving the aggregate material therein. There are hoppers provided at the bottom of the container. These hoppers have inclined walls. The hoppers can extend so as to allow the material from the inside of the container to be properly conveyed to a location exterior of the container. Actuators are used so as to expand and collapse the container.

U.S. Pat. No. 7,240,681, issued on Jul. 10, 2007 to L. Saik, describes a trailer-mounted mobile apparatus for dewatering and recovering formation sand. The trailer is mounted to a truck-towable trailer so as to receive sand therein. The container has a pair of sloping end walls. The back end of the container is suitably openable so as to allow the sand to be removed therefrom. A pneumatic or hydraulic ram is provided on the forward part of the container so as to allow the container to be lifted angularly upwardly so as to allow sand to be discharged through the gate at the rear of the container.

U.S. Pat. No. 4,247,228, issued on Jan. 27, 1981 to Gray et at, describes a dump truck or trailer with a pneumatic conveyor. The container is mounted to a frame on wheels. A hydraulic ram tilts the container for dumping through a rear outlet. A pneumatic conveyor is carried by the frame with an intake at the rear of the container. A gate allows the solids to be dumped conventionally by gravity or to be blown to a storage facility by the pneumatic container. The container has a top hatch formed therein so as to allow the solids to be introduced into the interior of the container.

U.S. Pat. No. 2,865,521, issued on Dec. 23, 1958 to Fisher et at, shows a bulk material truck that has an interior volume suitable for the receipt of bulk material therein. A pneumatic conveyer is utilized so as to allow the removal of such material from the bottom of the container. A pair of sloping walls are provided on opposite sides of the container so as to allow the bulk material within the container to be passed toward the bottom of the container. A top hatch is provided on the top of the conveyer. The pneumatic conveyer is connected to the bottom of the container.

It is an object of the present invention to provide a proppant storage vessel that allows proppant to be easily transported and stored.

It is another object of the present invention to provide a proppant storage vessel that allows the proppant that is contained within the storage vessel to be easily and efficiently discharged through the bottom thereof.

It is another object of the present invention to provide a proppant storage assembly which allows for the effective storage of proppant at the fracturing site.

It is another object of the present invention to provide a proppant storage assembly which allows proppant to be efficiently removed from a stacked configuration of containers.

These and other objects and advantages of the present invention will become apparent from a reading of the attached specification and appended claims.

## BRIEF SUMMARY OF THE INVENTION

The present invention is a proppant storage vessel that comprises a container having a first end wall, a second end wall, a first side wall and a second side wall. The container also has a top will and a bottom wall which serve to define an interior volume therein. A hatch is formed on the bottom wall of the container. The bottom hatch is movable between an open position and a closed position. A first inclined surface is positioned in the interior volume. The first inclined surface extends from the first end wall to the bottom hatch. A second inclined surface extends from the second end wall toward the bottom hatch. A third inclined surface extends from the first side wall toward the bottom hatch. A fourth inclined surface extends from the second side wall toward the bottom hatch. The walls have a rigidity suitable for containing at least 30,000 pounds of proppant therein. The container can have up to 100,000 pounds of proppant therein.

A top hatch formed on the top wall. The top hatch is movable between an open position and a closed position.

Each of the first and second end walls and the first and second side walls have a middle. The first inclined surface has an upper end affixed to the first end wall below the middle thereof. The second inclined surface has an upper end affixed to the second end wall below the middle thereof. The third inclined surface has an upper end affixed to the first side wall below the middle thereof. The fourth inclined surface has an upper end thereof affixed to the second side wall below the middle thereof.

A first support brace is affixed to the first and second end walls and extends therebetween. A second support brace is affixed to the first and second side walls and extends therebetween. A first support member has one end affixed to the bottom wall and extends angularly upwardly. The first support member has an opposite end affixed centrally to the first inclined surface. A second support member has one end affixed to the bottom wall and extends angularly upwardly therefrom. The second support member has an opposite end affixed centrally to the second inclined surface. Each of the first, second, third and fourth inclined surfaces has a bottom edge positioned adjacent a perimeter of the bottom hatch. The bottom hatch is hingedly affixed to the bottom wall. The bottom hatch resides against the bottom wall when in the closed position.

The present invention is also a proppant storage assembly that comprises a first container having an interior volume and a second container supported in spaced relation above the first container. The first container has a bottom wall having a bottom hatch affixed thereto. The hatch is movable between an open position and a closed position. The first container has an opening at a top wall thereof. The second container has bottom hatch formed on a bottom wall thereof. The bottom hatch of the second container is aligned with the opening of the first container such that a proppant in the first container can flow through the hatch thereof into the interior volume of the first container.

In particular, the first container has a top hatch hingedly affixed at the opening thereof. The top hatch of the first container is movable between a closed position and an open position. The bottom hatch of the second container has a length dimension. The length dimension is slightly less than a distance between the first container and the second container. The top hatch of the first container extends in parallel relation to the bottom hatch of the second container when each of the top hatch of the first container and the bottom hatch of the second container are in the open position.

A first spacer is positioned on the top wall of the first container and extends upwardly therefrom. The first spacer abuts the bottom wall of the second container. A second spacer is positioned on the top wall of the first container and extends upwardly therefrom. The second spacer abuts the bottom wall of the second container. The first spacer is in spaced relation to the second spacer. A pad is positioned against the bottom wall of the first container. The pad supports the bottom wall of the first container a desired distance above an underlying surface. The bottom hatch of the first container has a length dimension. This length dimension is less than a desired distance between the bottom wall and the underlying surface. As such, a portable conveyer can be placed thereunder. The portable container has a surface positioned between the bottom wall of the first container and the underlying surface. The surface of the portable container is directly below the bottom hatch of the first container.

Each of the first and second containers has a first end wall, a second end wall a first side wall and a second side wall. A first inclined surface is positioned in the interior volume of the container so as to extend from the first end wall toward the bottom hatch. A second inclined surface is positioned in the interior volume of the container so as to extend from the second end wall toward the bottom hatch. A third inclined surface is positioned in the interior volume so as to extend from the first side wall toward the bottom hatch. A fourth inclined surface is positioned in the interior volume so as to extend from the second side wall toward the bottom hatch.

A third container can be supported in spaced relation above the second container. The second container has a top hatch formed on a top wall thereof. The third container has a bottom hatch formed on a bottom wall thereof. The bottom hatch of the third container is aligned with the top hatch of the second container. Each of the containers is ocean freight container.

In an alternative embodiment of the present invention, the first container has the first side wall, a second side wall, a first end wall and second end wall hingedly mounted to the bottom wall thereof. A first slot and a second slot are affixed to the bottom wall of the container. The first and second slots are suitable for the receipt of forks of a forklift therein.

The foregoing Summary of the Invention is intended to describe, in summary, the preferred embodiments of the present invention. However, this section is not intended, in any way, to limit the scope of the present invention. The scope of the present invention should be defined by the claims herein and their legal equivalents.

## BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

FIG. **1** is a side elevational view of the proppant storage assembly in accordance with the preferred embodiment of the present invention.

FIG. **2** is an end view of the proppant storage assembly of the present invention showing, in particular, the portable conveyer located at a bottom thereof.

FIG. **3** is a transparent plan view of the proppant storage container in accordance with the preferred embodiment of the present invention.

FIG. **4** is a plan view showing of the proppant storage container of the present invention.

FIG. **5** is a cross-sectional view as taken from an end of the proppant storage container of the present invention.

FIG. **6** is cross-sectional view as taken across a side of the proppant storage container of the present invention.

FIG. **7** is a perspective view of an alternative embodiment of the proppant storage container of the present invention.

## DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. **1**, there is shown the proppant storage assembly **10** in accordance with the preferred embodiment of the present invention. The proppant storage assembly **10** includes a first container **12** having an interior volume **14** and a second container **16** having a interior volume **18**. The first container **12** is in spaced relationship to the second container **16**. The first container **12** has a bottom wall **20**. The bottom wall **20** has a bottom hatch **22** affixed thereto. The hatch **22** is movable between a closed position and an open position (illustrated in broken line fashion). The first container **12** has an opening **24** at a top wall **26** thereof. The second container **16** has a hatch **28** formed on a bottom wall **30** thereof. The bottom hatch **28** of the second container **16** is shown as aligned, with the opening **26** of the first container **12** such that a proppant within the second container **16** can flow through the hatch **28** into the interior volume **14** of the first container **12**.

In particular, FIG. **1**, it can be seen that the first container **12** has a hatch **32** extending over the opening **24** thereof. In particular, the hatch **32** is hingedly mounted to the top will **26** of the first container **12** so as to be movable between a closed position and an open position (illustrated in broken-line fashion). In particular, the bottom hatch **28** of the second container **16** will extend downwardly perpendicularly to the bottom wall **30**. Similarly, the top hatch **32** of the first container **12** will extend upwardly in generally transverse relationship to the top wall **26**. The hatches **28** and **32** will be in generally parallel relationship in this configuration. As such, the hatches **24** and **28** will form a unique and guided flowpath whereby the proppant in the interior volume **18** of the second container **16** can flow directly into the opening **24** and into the interior volume **14** of the first container **12**. The length dimension of the hatches **28** and **32** will be less than the distance between the top wall **26** of the first container **12** and the bottom wall **30** of the second container **16**.

A first spacer **34** is positioned on the top wall **26** of the first container **12** and extends upwardly therefrom. The first spacer **34** abuts the bottom wall **30** of the second container **16**. A second spacer **36** is positioned on the top wall **26** of the first container **12** and extends upwardly therefrom. The second, spacer **36** abuts the bottom wall **30** of the second container **16**. The first spacer **34** is in spaced relationship to the second spacer **36**. The spacers **34** and **36** serve to assure a proper distance between the containers **12** and **16** whereby the hatches **28** and **32** can be properly opened so as to allow for the flow of proppant therebetween. A pad **38** is positioned against the bottom wall **20** of the first container **12**. The pad **38** serves to support the first container **12** above an underlying surface **40** (such as the earth). It can be seen that the pad **38** is in the nature of a concrete structure that has a base **42** embedded into the earth. As such, the pad **38** is configured so as to rigidly support the containers **12** and **16** in their desired positions above the earth.

Pad **38** support the container **12** in a suitable distance above the underlying surface **40** such that the hatch **22** can move from its dosed position to its open position while allowing a certain amount of space therebetween. As a result, a portable conveyer can be placed below the bottom hatch **22** so as to allow the proppant within the interior volume **14** to be discharged therefrom.

A third container **44** is supported in spaced relationship above the top wall **46** of the second container **16**. As can be seen, the third container has a bottom hatch **48** located on the bottom wall **50** thereof. The top wall **46** has a top hatch **52** hingedly connected thereto. As a result, when the bottom hatch **48** is opened and the top hatch **52** is opened (as illustrated in broken-line fashion), the proppant within the interior volume **54** of the third container **44** can flow directly into the interior volume **18** of the second container **16**. Suitable spacers **56** serve to support the bottom wall **50** of the third container **44** a proper distance above the top wall **46** of the second container **16**. Third container **44** also has a top hatch **58** that is movable between a closed position and an open position (illustrated in broken-line fashion).

In the configuration shown in FIG. **1**, volumes of proppants can be easily stored at the fracturing site. It is only necessary to stack each of the containers **12**, **16** and **44** upon one another in the manner described in FIG. **1**. Each of the containers **12**, **16** and **44** has an exterior configuration similar to that of an ocean freight container. As such, these containers can be easily transported on the bed of a truck, on a freight train or on a ship to the desired location. Because of this stacking arrangement, special proppant storage facilities are not required at the fracturing site. Each of the hatches **28**, **32**, **48**, **52** and **58** can be in a liquid-tight sealing relationship over the respective openings thereof when in the closed position. As such, the arrangement illustrated in FIG. **1** of the proppant storage assembly **10** can avoid any liquid intrusion into the proppant contained within each of the containers **12**, **16** and **44**. Typically, a forklift, or other lifting device, can be utilized so as to properly stack the containers. Within the concept of the present invention, two containers, three containers, or more can be utilized in the construction of the proppant storage assembly **10**. Each of the containers **12**, **16** and **44** has an interior structure in the nature illustrated in FIGS. **3-6** herein, as will be described hereinafter. The present invention provides a suitably modular arrangement whereby a proppant storage facility can be easily constructed on-site. After the fracturing operation is completed, the containers can be easily removed from this stacked configuration and transported to another location. Similarly, if desired, the containers **12**, **16** and **44** can be suitably replaced by another container so as to provide the desired proppant to the fracturing site.

FIG. **2** shows an end view of the proppant storage assembly **10** of the present invention showing, of the present invention. In FIG. **2**, it can be seen that the first container **12** is spaced from the second container **16**. The second container **16** is suitably spaced from the third container **44**. The bottom hatch **22** of the first container is openable so that the proppant within the first container **12** can be discharged through the batch **22** onto a portable conveyer **60**. The portable conveyer **60** can be easily transported to a location below the hatch **22** of the first container **12** so as to allow the proppant from the containers to be transported to another location. Each of the containers **12**, **16** and **44** is vertically aligned in a stacked orientation. The first container has a capacity for storing 100,000 pounds of proppant. The second container **16** and the third container **44** can store 30,000 pounds of proppant. As such, a very large amount of proppant can be provided to the fracturing site, in a simple easy and convenient manner.

FIG. **3** illustrates the interior construction of the first container **12**. The top wall of the first container **12** has been removed for the purposes of illustration. The container **12** has a first end wall **70**, a second end wall **72**, a first side wall **74**

and a second side wall **76**. The end walls **70** and **72** extend between the side walls **74** and **76** so as to define the interior volume of the first container **12**. A first inclined surface **78** extends from the first end wall **70** to the bottom hatch **22**. A second inclined surface **80** extends from the second end wall **72** toward the bottom hatch **22**. A third inclined surface **82** extends from the first side wall **74** toward the bottom hatch **22**. Similarly, a fourth inclined surface **84** extends from the second side wall **76** toward the bottom hatch **22**. Lower ends of each of the inclined surface **78**, **80**, **82** and **84** are aligned with the perimeter of the bottom hatch **22**. The inclining of the side walls **78**, **80**, **82** and **84** serves to assure that the proppant contained within the interior volume thereof is suitably funneled toward the bottom hatch **22**. Each of the inclined surface **78**, **80**, **82** and **84** is has as smooth surface so that a constant flow of proppant can occur.

FIG. **4** illustrates the bracing associated with the first container **12** so as to assure the structural integrity of the container. As can be seen, a first support brace **90** is affixed to the first end wall **70** and extends across the interior volume of the container **12** to the second end wall **72**. The first support brace **90** is suitably welded to the end walls **70** and **72** so as to provide a rigid structural support therebetween. A second support brace **92** has one end affixed to the side wall **74** and an opposite end affixed to the side wall **76**. The second support brace **92** extends transversely to the first support brace **90**. The second support brace **92** provides a rigid support for the side walls **74** and **76**. The first support brace **90** and the second support brace **92** structurally enhance the strength of the container **12** so as to as to withstand the weight of the proppant that is contained therein. The second support brace **92** can also include another support brace **94** extending between the side walls **74** and **76** in generally parallel relationship to the first support brace **90**. Within the concept of the present invention, various other support braces, in the nature of angle irons, can be utilized so as to suitably support the structure of the container **12**.

FIG. **5** illustrates a cross-sectional view of the container **12**. As can be seen, the container **12** has the bottom hatch **22** located on the bottom wall **20** thereof. A top hatch **32** is hingedly mounted to the top wall **26** thereof. Hatch **32** serves to cover the opening **24** in the top wall **26**. The bottom hatch **22** is hingedly mounted to the bottom surface of the bottom wall **20** and can be suitably latched to the bottom wall **20** so as to retain the proppant **100** therein. The container **12** has its side walls **74** and **76** extending vertically upwardly from the bottom wall **20**. The first inclined surface **78** and the second inclined surface **80** are illustrated as funneling the proppant **100** toward the bottom hatch **22**. The first inclined surface **78** has one end mounted adjacent to hatch **22** and an opposite end affixed to the side wall **74**. In particular, the inclined surface **78** as its opposite end at the side wall **74** located below the middle of the side wall **74**. Similarly, the second inclined surface **80** extends from the hatch **22** toward the side wall **76** at a location below the middle of the side wall **76**. The second support brace **92** is illustrated as extending across the interior volume **14** of the first container **12** between the side walls **74** and **76**.

FIG. **6** shows another cross-sectional view of the first container **12**. First container **12** is illustrated also as having the top hatch **32** hingedly mounted to the top wall **26** and the bottom hatch **22** hingedly mounted to the bottom wall **20**. The third inclined surface **82** extends from the bottom hatch **22** to the side wall **74**. The fourth inclined surface **84** extends from the bottom hatch **22** toward the side wall **76**. Each of the ends of the inclined surfaces **82** and **84** will joined to the respective walls **74** and **76** at a location below the middle of each of the side walls **74** and **76**. The first support brace **90** extends between the side walls **74** and **76** so as to provide structural integrity.

In FIG. **6**, there is a first support member **102** that extends from the bottom wall **20** upwardly toward a location centrally of the third inclined surface **82**. Another support member **104** extends from the bottom wall **20** upwardly toward a center of the fourth inclined surface **84**. These support members **102** and **104** enhance the strength of the inclined surface **82** and **84** so as to withstand the weight and forces imparted thereto by the proppant **100**.

FIG. **7** shows an alternative embodiment of the container **110** of the present invention. Container **110** includes a first end wall **112**, a second end wall **114**, a first side wall **116**, and a second side wall **118**. Each of the end walls **112** and **114** and each of the side walls **116** and **118** are illustrated as extending upwardly from a bottom wall **120**.

Within concept shown in FIG. **7**, each of the end walls **112** and **114** and each of the side walls **116** and **118** are hingedly mounted to the bottom wall **120**. It can be seen that there are latch members **122**, **124** and **126** that serve to secure the walls **112**, **114**, **116** and **118** in their upright configuration. Latch members **122** join the side wall **116** to the end **112**. Latch members **124** join the side wall **116** to the end walls **114**. Latch members **126** secure the end wall **114** to the side walls **118**. An additional latch member (not illustrated) will secure the end wall **112** to the side wall **118**. As such, the structure of the container **110** can be in a sand receiving orientation.

Importantly, since each of the walls **112**, **114**, **116** and **118** are hingedly secured to the bottom wall **120**, the walls can be pivoted about the hinges so as to overlie the bottom **112** once the latch members **122**, **124** and **126** are released. A handle **128** is provided on the end walls **112** and **114** so as to allow the container **110** to be moved, as desired. Wheels **130** extend downwardly from the bottom wall **120** so as to allow the container **110** to be rolled to a desired position.

In FIG. **7**, there is first slot **112** and a second slot **134** formed on the bottom of the bottom surface **120**. Slots **132** and **134** allow fir the receipt of the forks of a forklift therein. As such, the container **110** can be moved to a desired location in a simple and efficient manner.

The present application is a continuation of is related to and claims priority to, and the benefit of, U.S. Non-Provisional application Ser. No. 13/949,693, filed Jul. 24, 2013, titled "Proppant Storage Vessel and Assembly Thereof," which is a continuation-in-part of U.S. Non-Provisional application Ser. No. 13/660,840, filed Oct. 25, 2012, titled "Proppant Storage Vessel and Assembly Thereof," now U.S. Pat. No. 8,505,780, issued Aug. 13, 2013, which is a continuation of U.S. Non-Provisional application Ser. No. 13/332,937, filed Dec. 21, 2011, titled "Proppant Storage Vessel and Assembly Thereof," now U.S. Pat. No. 8,827,118, issued Sep. 9, 2014, each of which are incorporated herein in their entireties by reference.

The foregoing disclosure and description of the invention is illustrative and explanatory thereof. Various changes in the details of the illustrated construction can be made within the scope of the appended claims without departing from the true spirit of the invention. The present invention should only be limited by the following, claims and their legal equivalents.

I claim:

**1**. A container structurally strengthened to transport and store large volumes of proppant effectively therein, the container comprising:

a top;

a bottom, having an outlet formed therein;

sidewalls coupled to the top and bottom, so as to define an interior volume of the container thereby to store the proppant therein;

a plurality of sidewall supports positioned to provide structural support to the sidewalls when large volumes of proppant are positioned within the interior volume, the proppant comprising sand having a substantially spherical shape and a tightly graded particle distribution, the plurality of sidewall supports including a plurality of support braces extending in a substantially horizontal position and positioned in direct contact with interior surfaces of the sidewalls to enhance support of the sidewalls when the container is filled with the proppant, the container including a container frame structurally arranged to support another container when filled with large volumes of proppant and when positioned in a vertically stacked arrangement thereabove, and the large volumes are at least 30,000 pounds;

ramps downwardly inclined and extending inwardly from the sidewalls to direct the proppant toward the outlet when the proppant is stored therein, at least one support brace of the plurality of support braces being positioned vertically higher than the ramps; and

a hatch positioned proximate the outlet, the hatch being moveable between open and closed positions.

**2**. The container of claim **1**, wherein the container comprises a first container, and wherein the outlet is adapted to be positioned adjacent a second container having a second top with an opening formed therein, the first container being adapted to discharge the proppant from the outlet and into a second interior volume of the second container, and wherein the proppant further comprises sand.

**3**. The container of claim **1**, wherein the plurality of support braces comprises a first set of support braces attached to a first pair of sidewalls and a second set of support braces attached to a second pair of sidewalls, the first set of support braces extending in a direction toward the second set of support braces.

**4**. The container of claim **1**, comprising a plurality of support members attached to a bottom surface of the ramps and extending downwardly toward the bottom.

**5**. The container of claim **4**, wherein the plurality of support members are arranged at respective angles relative to the bottom and the support members are attached to the bottom.

**6**. The container of claim **4**, wherein at least one support member of the plurality of support members is positioned vertically lower than the plurality of support braces.

**7**. A system structurally strengthened to transport and store large volumes of proppant effectively therein, the system comprising:

a first container comprising:

a first top;

a first bottom, having a first outlet formed therein to allow large volumes of proppant to flow therefrom when the outlet is in an open position;

a first plurality of sidewalls coupled to the first top and first bottom, so as to define a first interior volume of the first container thereby to store the proppant therein;

a first plurality of structural supports positioned to provide structural support to the first plurality of sidewalls when large volumes of proppant are positioned within the first interior volume, the proppant having a substantially spherical shape and a tightly graded particle distribution; and

a first plurality of ramps downwardly inclined and extending inwardly from the first plurality of sidewalls to direct the proppant toward the first outlet when the proppant is stored therein;

a second container adapted to be positioned below the first container to receive proppant when flowing from the first outlet of the first container, the second container comprising:

a second top, having an opening formed therein;

a second bottom, having a second outlet formed therein to allow large volumes of proppant to flow therefrom when in an open position;

a second plurality of sidewalls coupled to the second top and second bottom, so as to define a second interior volume of the second container thereby to store the proppant therein;

a second plurality of structural supports positioned to provide structural support to the second plurality of sidewalls when large volumes of proppant are positioned within the second interior volume, the proppant having a substantially spherical shape and a tightly graded particle distribution;

a second plurality of ramps downwardly inclined and extending inwardly from the second plurality of sidewalls to direct the proppant toward the second outlet when the proppant is stored therein;

one or more spacers positioned between the first container and the second container, the spacers contacting the second top and the first bottom and arranging the first and second containers in a spaced relationship; and

a conveyor positioned below the second outlet such that proppant exiting the second container through the second outlet is deposited on the conveyor and transported away from the second container.

**8**. The system of claim **7**, wherein the first container further comprises a first hatch movable toward the second container to transition the first hatch to the open position to allow proppant to flow from the first outlet, wherein the second container further comprises a second hatch movable toward the first container to transition the second hatch to an open position, and a distance between the first and second containers is great enough to allow the first hatch and the second hatch to be in respective open positions at the same time.

**9**. The system of claim **7**, wherein the first container and the second container are vertically aligned in a stacked orientation, wherein the proppant comprises sand, and wherein the large volumes comprise at least 30,000 pounds of sand.

**10**. The system of claim **7**, wherein the first plurality of structural supports comprises a first plurality of support braces, the first plurality of support braces comprises a first set of support braces attached to a first pair of sidewalls and a second set of support braces attached to a second pair of sidewalls, the first set of support braces extending in a direction toward the second set of support braces.

**11**. The system of claim **7**, wherein the first container further comprises a plurality of support members attached to respective bottom surfaces of the first plurality of ramps, the plurality of support members extending downwardly toward the bottom to support the ramps, and the plurality of support braces members extend in a substantially horizontal position.

**12**. The system of claim **7**, wherein each of the first and second containers includes a container frame structurally arranged to support another container when filled with large volumes of proppant and positioned in a vertically stacked arrangement thereabove such that each of the first and second containers is structurally adapted to support the other container when the proppant is positioned therein.

**13**. A method for delivering large volumes of proppant to a fracturing site, the method comprising:

positioning a first container to structurally support large volumes of proppant and being filled with large volumes of proppant near a fracturing site, the proppant comprising sand, the first container having a first opening in a first top with a first hatch moveable between a first open position and a first closed position, and a first outlet in a first bottom to allow proppant to flow therefrom when in an open position and to prevent proppant to flow therefrom when in a closed position;

stacking a second container to structurally support large volumes of proppant when positioned therein and being in a vertically stacked positioned above the first container, the second container being filled with large volumes of proppant, having a second opening in a second top of the second container with a second hatch moveable between a second open position and a second closed position, and having a second outlet in a second bottom of the second container to allow proppant to flow therefrom when in an open position;

moving the second container to a position at the fracturing site to allow proppant to flow therefrom through the second outlet; and

moving the first container to a position adjacent the second container at the fracturing site to allow proppant to flow from the first container onto a conveyor positioned at an elevation below the first outlet and the second outlet.

**14**. The method of claim **13**, comprising arranging spacers between the first and second containers to provide clearance for the first open position at the same time as the third open position.

**15**. The method of claim **13**, wherein the first and second containers each comprises a plurality of structural supports positioned to provide structural support to the sidewalls, wherein the proppant comprises sand, and wherein the large volumes comprise at least 30,000 pounds of sand.

**16**. The method of claim **13**, comprising moving the second container when the second container is empty of the proppant and replacing the second container with a third container to structurally support large volumes of proppant therein and being filled with the large volumes of proppant, the third container having a third outlet formed in the bottom thereof and being positioned at an elevation to overlie the conveyor thereby to dispense the proppant through the third outlet and onto the conveyor.

**17**. The method of claim **16**, wherein each of the first and second containers includes a container frame structurally arranged to support another container when filled with large volumes of proppant and positioned in a vertically stacked arrangement thereabove such that each of the first and second containers is structurally adapted to support the other container when the proppant is positioned therein.

**18**. A container structurally strengthened to transport and store large volumes of proppant effectively therein, the container comprising:

a top;

a bottom, having an outlet formed therein;

sidewalls coupled to the top and bottom, so as to define an interior volume of the container thereby to store the proppant therein;

a plurality of sidewall supports positioned to provide structural support to the sidewalls when large volumes of proppant are positioned within the interior volume, the proppant having a substantially spherical shape and a tightly graded particle distribution, the plurality of sidewall supports including a plurality of support braces extending in a substantially horizontal position, the container including a container frame structurally arranged to support another container when filled with large volumes of proppant and when positioned in a vertically stacked arrangement thereabove, and the large volumes are at least 30,000 pounds;

ramps downwardly inclined and extending inwardly from the sidewalls to direct the proppant toward the outlet when the proppant is stored therein, a plurality of support members attached to a bottom surface of the ramps and extending downwardly toward the bottom, and at least one support brace of the plurality of support braces being positioned vertically higher than the ramps;

a plurality of support members attached to a bottom surface of the ramps and extending downwardly toward the bottom; and

a hatch positioned proximate the outlet, the hatch being moveable between open and closed positions.

**19**. The container of claim **18**, wherein the plurality of support members are arranged at respective angles relative to the bottom and the support members are attached to the bottom.

**20**. The container of claim **18**, wherein at least one support member of the plurality of support members is positioned vertically lower than the plurality of support braces.

**21**. A system structurally strengthened to transport and store large volumes of proppant effectively therein, the system comprising:

a first container comprising:

a first top;

a first bottom, having a first outlet formed therein to allow large volumes of proppant to flow therefrom when the outlet is in an open position;

a first plurality of sidewalls coupled to the first top and first bottom, so as to define a first interior volume of the first container thereby to store the proppant therein;

a first plurality of structural supports positioned to provide structural support to the first plurality of sidewalls when large volumes of proppant are positioned within the first interior volume, the proppant having a substantially spherical shape and a tightly graded particle distribution; and

a first plurality of ramps downwardly inclined and extending inwardly from the first plurality of sidewalls to direct the proppant toward the first outlet when the proppant is stored therein;

a second container adapted to be positioned below the first container to receive proppant when flowing from the first outlet of the first container, the second container comprising:

a second top, having an opening formed therein;

a second bottom, having a second outlet formed therein to allow large volumes of proppant to flow therefrom when in an open position;

a second plurality of sidewalls coupled to the second top and second bottom, so as to define a second interior volume of the second container thereby to store the proppant therein;

a second plurality of structural supports positioned to provide structural support to the second plurality of sidewalls when large volumes of proppant are positioned within the second interior volume, the proppant having a substantially spherical shape and a tightly graded particle distribution;

a second plurality of ramps downwardly inclined and extending inwardly from the second plurality of sidewalls to direct the proppant toward the second outlet when the proppant is stored therein;

a conveyor positioned below the second outlet such that proppant exiting the second container through the second outlet is deposited on the conveyor and transported away from the second container; and

the first container further comprises a first hatch movable toward the second container to transition the first hatch to the open position to allow proppant to flow from the first outlet, the second container further comprises a second hatch movable toward the first container to transition the second hatch to an open position, and a distance between the first and second containers is great enough to allow the first hatch and the second hatch to be in respective open positions at the same time.

**22**. A system structurally strengthened to transport and store large volumes of proppant effectively therein, the system comprising:

a first container comprising:

a first top,

a first bottom, having a first outlet formed therein to allow large volumes of proppant to flow therefrom when the outlet is in an open position,

a first plurality of sidewalls coupled to the first top and first bottom, so as to define a first interior volume of the first container thereby to store the proppant therein,

a first plurality of structural supports positioned to provide structural support to the first plurality of sidewalls when large volumes of proppant are positioned within the first interior volume, the proppant having a substantially spherical shape and a tightly graded particle distribution,

a first plurality of ramps downwardly inclined and extending inwardly from the first plurality of sidewalls to direct the proppant toward the first outlet when the proppant is stored therein, and

a plurality of support members attached to respective bottom surfaces of the first plurality of ramps, the plurality of support members extending downwardly toward the bottom to support the ramps, and the plurality of support members extend in a substantially horizontal position; and

a second container adapted to be positioned below the first container to receive proppant when flowing from the first outlet of the first container, the second container comprising:

a second top, having an opening formed therein,

a second bottom, having a second outlet formed therein to allow large volumes of proppant to flow therefrom when in an open position,

a second plurality of sidewalls coupled to the second top and second bottom, so as to define a second interior volume of the second container thereby to store the proppant therein;

a second plurality of structural supports positioned to provide structural support to the second plurality of sidewalls when large volumes of proppant are positioned within the second interior volume, the proppant having a substantially spherical shape and a tightly graded particle distribution, and

a second plurality of ramps downwardly inclined and extending inwardly from the second plurality of sidewalls to direct the proppant toward the second outlet when the proppant is stored therein; and

a conveyor positioned below the second outlet such that proppant exiting the second container through the second outlet is deposited on the conveyor and transported away from the second container.

* * * * *