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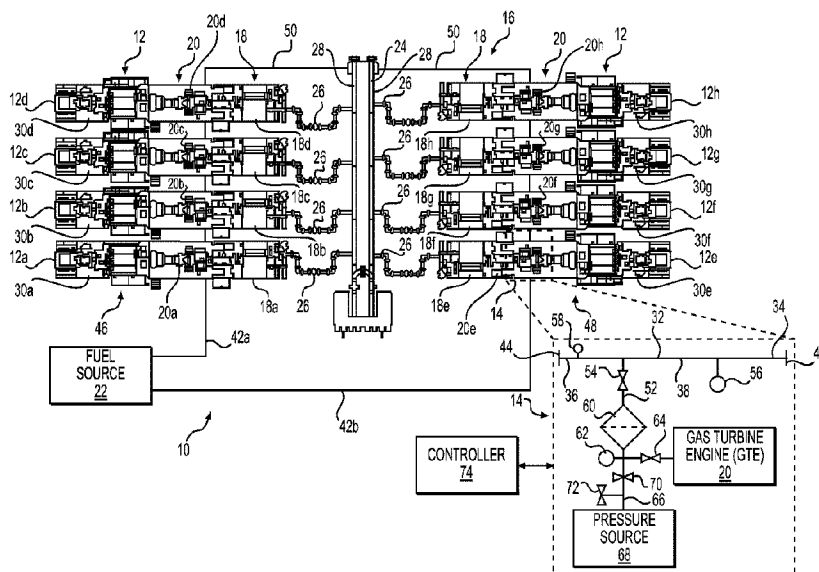
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(57) Abrégé/Abstract:

Embodiments of system and methods for supplying fuel, enabling communications, and conveying electric power associated with operation of a hydraulic fracturing unit of a plurality of hydraulic fracturing units are disclosed and may include a fuel line connection assembly configured to be connected to the first hydraulic fracturing unit and to supply fuel from a fuel source to a gas turbine engine connected to the hydraulic fracturing unit. A system also may include a communications cable assembly configured to be connected to the hydraulic fracturing unit and to enable data communications between the hydraulic fracturing unit and a data center or another hydraulic fracturing unit. A system further may include a power cable assembly configured to be connected to the hydraulic fracturing unit and to convey electric power between the hydraulic fracturing unit and a remote electrical power source or the plurality of hydraulic fracturing units.

ABSTRACT

Embodiments of system and methods for supplying fuel, enabling communications, and conveying electric power associated with operation of a hydraulic fracturing unit of a plurality of hydraulic fracturing units are disclosed and may include a fuel line connection assembly configured to be connected to the first hydraulic fracturing unit and to supply fuel from a fuel source to a gas turbine engine connected to the hydraulic fracturing unit. A system also may include a communications cable assembly configured to be connected to the hydraulic fracturing unit and to enable data communications between the hydraulic fracturing unit and a data center or another hydraulic fracturing unit. A system further may include a power cable assembly configured to be connected to the hydraulic fracturing unit and to convey electric power between the hydraulic fracturing unit and a remote electrical power source or the plurality of hydraulic fracturing units.

FUEL, COMMUNICATIONS, AND POWER CONNECTION SYSTEMS AND RELATED METHODS

Technical Field

[0001] The present disclosure relates to systems and methods for supplying fuel, enabling communications, and/or conveying electric power to machines, and more particularly, to systems and methods for supplying fuel, enabling communications, and/or conveying electric power to a plurality of hydraulic fracturing units.

Background

[0002] Fracturing is an oilfield operation that stimulates production of hydrocarbons, such that the hydrocarbons may more easily or readily flow from a subsurface formation to a well. For example, a fracturing system may be configured to fracture a formation by pumping a fracking fluid into a well at high pressure and high flow rates. Some fracking fluids may take the form of a slurry including water, proppants, and/or other additives, such as thickening agents and/or gels. The slurry may be forced via one or more pumps into the formation at rates faster than can be accepted by the existing pores, fractures, faults, or other spaces within the formation. As a result, pressure builds rapidly to the point where the formation fails and begins to fracture. By continuing to pump the fracking fluid into the formation, existing fractures in the formation are caused to expand and extend in directions farther away from a well bore, thereby creating flow paths to the well bore. The proppants may serve to prevent the expanded fractures from closing when pumping of the fracking fluid is ceased or may reduce the extent to which the expanded fractures contract when pumping of the fracking fluid is ceased. Once the formation is fractured, large quantities of the injected fracking fluid are allowed to flow out

of the well, and the production stream of hydrocarbons may be obtained from the formation.

[0003] A fracturing system includes a large number of separate components required for executing a fracturing operation, each of which must be transported to the fracturing site in an at least partially disassembled state, assembled, and provided with a supply of fuel and electricity for operation, as well as data communications links for controlling the operation. Providing fuel delivery lines, communications links, and electric power to and between the numerous components when setting-up the fracturing operation requires a significant number of skilled personnel, numerous tools, and a substantial amount of time, all contributing significantly to the cost of the fracturing operation. Following completion of the fracturing operation, the components must be broken-down and transported from the fracturing site to another fracturing site. Thus, significant time and cost are involved with setting-up and tearing-down the fracturing operation. In addition, depending on the requirements of a particular operation and the site on which it occurs, different a fracturing operations may require different components and arrangements, which may add complexity to setting-up and tearing-down the fracturing operation, further adding to the time and costs associated with the fracturing operation.

[0004] Accordingly, it can be seen that a need exists for systems and methods that provide greater efficiency when setting-up and tearing-down components associated with a fracturing operation. The present disclosure may address one or more of the above-referenced drawbacks, as well as other possible drawbacks.

Summary

[0005] The present disclosure is generally directed to systems and methods for supplying fuel, enabling communications, and/or conveying electric power to machines, and more particularly, to a plurality of hydraulic fracturing units associated with a hydraulic fracturing system. For example, in some embodiments, a fuel line connection assembly for providing flow communication between a fuel source and a first gas turbine engine of a plurality of gas turbine engines may include a manifold line defining an inlet end, an outlet end, and a flow path for fuel extending between the inlet end and the outlet end. The fuel line connection assembly may further include an inlet coupling proximate the inlet end and configured to be connected to a fuel line providing flow communication with the fuel source, and an outlet coupling proximate the outlet end and configured to be connected to one of an inlet end of another manifold line or a blocking device configured to prevent flow from the outlet end of the manifold line. The fuel line connection assembly may further include a distribution line connected to the manifold line and configured to provide flow communication between the manifold line and the first gas turbine engine, and a valve in one of the manifold line or the distribution line and configured to change between an open condition through which fluid flows and a closed condition preventing fluid flow. The valve may be configured to one of facilitate flow communication or prevent flow communication between the fuel source and the first gas turbine engine. The fuel line connection assembly may be configured to one of: (1) provide flow communication between a second gas turbine engine of the plurality of gas turbine engines upstream of the first gas turbine engine and a third gas turbine engine of the plurality of gas turbine

engines downstream of the first gas turbine engine; or (2) provide flow communication solely between the fuel source and the first gas turbine engine.

[0006] According some embodiments, a fuel delivery system configured to supply fuel to a plurality of gas turbine engines connected to a plurality of pumps of a hydraulic fracturing system may include a plurality of fuel line connection assemblies. The fuel line connection assemblies may include a manifold line defining an inlet end, an outlet end, and a flow path for fuel extending between the inlet end and the outlet end. The fuel line connection assembly may also include an inlet coupling proximate the inlet end and configured to be connected to a fuel line providing flow communication with the fuel source, and an outlet coupling proximate the outlet end and configured to be connected to one of an inlet end of another manifold line or a blocking device configured to prevent flow from the outlet end of the manifold line. The fuel line connection assembly may also include a distribution line connected to the manifold line and configured to provide flow communication between the manifold line and the first gas turbine engine, and a valve in one of the manifold line or the distribution line and configured to change between an open condition through which fluid flows and a closed condition preventing fluid flow. The valve may be further configured to one of facilitate flow communication or prevent flow communication between the fuel source and the first gas turbine engine. A first fuel line connection assembly of the plurality of fuel line connection assemblies may be in flow communication with a first outlet coupling of the fuel source via an inlet coupling of the first fuel line connection assembly. A second fuel line connection assembly of the plurality of fuel line connection assemblies may be in flow communication with one of an outlet

coupling of the first fuel line connection assembly or a second outlet coupling of the fuel source via an inlet coupling of the second fuel line connection assembly.

[0007] According to some embodiments, a method for pressure testing at least a portion of a fuel delivery system for supplying fuel from a fuel source to a plurality of gas turbine engines may include causing a first valve to be in an open condition. The first valve may be configured to one of facilitate flow communication or prevent flow communication between the fuel source and a first gas turbine engine of the plurality of gas turbine engines. The method may further include causing a second valve to be in a closed condition. The second valve may be configured to one of facilitate flow communication or prevent flow communication between a filter configured to filter one or more of particulates or liquids from fuel and the first gas turbine engine. The method may further include causing a third valve to be in an open condition. The third valve may be configured to one of facilitate flow communication or prevent flow communication between a pressure source and the filter. The method may further include increasing pressure via the pressure source in the at least a portion of the fuel delivery system, and monitoring a signal indicative of pressure in the at least a portion of the fuel delivery system. The method may also include, based at least in part on the signal, determining whether the at least a portion of the fuel delivery system has a leak.

[0008] According to some embodiments, a system for supplying fuel, enabling communications, and conveying electric power associated with operation of a hydraulic fracturing unit associated with a plurality of hydraulic fracturing units may include a fuel line connection assembly configured to be connected to the hydraulic fracturing unit and to supply fuel from a fuel source to a first gas turbine engine connected to the hydraulic

fracturing unit. The fuel line connection assembly may include a manifold line defining an inlet end, an outlet end, and a flow path for fuel extending between the inlet end and the outlet end. The fuel connection assembly may also include a distribution line connected to the manifold line and configured to provide flow communication between the manifold line and the first gas turbine engine. The fuel line connection assembly may be configured to one of: (1) provide flow communication between one of the fuel source or a second gas turbine engine of the plurality of the hydraulic fracturing units upstream of the first gas turbine engine and a third gas turbine engine of the plurality of hydraulic fracturing units downstream of the first gas turbine engine; or (2) provide flow communication solely between the fuel source and the first gas turbine engine. The system may also include a communications cable assembly configured to be connected to the hydraulic fracturing unit and to enable data communications between the hydraulic fracturing unit and one of a data center remote from the hydraulic fracturing unit or a second hydraulic fracturing unit of the plurality of hydraulic fracturing units. The communications cable assembly may include a length of communications cable and a communications cable storage apparatus configured to be connected to the hydraulic fracturing unit, to store the length of communications cable when not in use, and to facilitate deployment of at least a portion of the length of communications cable for connection to the one of the data center or the second hydraulic fracturing unit. The system may also include a power cable assembly configured to be connected to the hydraulic fracturing unit and to convey electric power between the hydraulic fracturing unit and one or more of a remote electrical power source or one or more of the plurality of hydraulic fracturing units. The power cable assembly may include a length of power cable and a power cable storage apparatus configured to

be connected to the hydraulic fracturing unit, to store the length of power cable when not in use, and to facilitate deployment of at least a portion of the length of power cable for use.

[0009] According to some embodiments, a hydraulic fracturing unit may include a chassis, a pump connected to the chassis and configured to pump a fracturing fluid, and a first gas turbine engine connected to the chassis and configured to convert fuel into a power output for operating the pump. The hydraulic fracturing unit may also include a system for supplying fuel, enabling communications, and conveying electric power associated with operation of the hydraulic fracturing unit. The system may include a fuel line connection assembly connected to the hydraulic fracturing unit and configured to supply fuel from a fuel source to the first gas turbine engine connected to the chassis. The fuel line connection assembly may include a manifold line defining an inlet end, an outlet end, and a flow path for fuel extending between the inlet end and the outlet end. The fuel line connection assembly may also include a distribution line connected to the manifold line and configured to provide flow communication between the manifold line and the first gas turbine engine. The fuel line connection assembly may be configured to one of: (1) provide flow communication between one of the fuel source or a second gas turbine engine of a second hydraulic fracturing unit upstream of the first gas turbine engine and a third gas turbine engine of a hydraulic fracturing unit downstream of the first gas turbine engine; or (2) provide flow communication solely between the fuel source and the first gas turbine engine. The system may also include a communications cable assembly connected to the hydraulic fracturing unit and configured to enable data communications between the hydraulic fracturing unit and one of a data center remote

from the hydraulic fracturing unit or an additional hydraulic fracturing unit. The communications cable assembly may include a length of communications cable and a communications cable storage apparatus connected to the hydraulic fracturing unit and configured to store the length of communications cable when not in use and to facilitate deployment of at least a portion of the length of communications cable for connection to the one of the data center or the another hydraulic fracturing unit. The system may also include a power cable assembly connected to the hydraulic fracturing unit and configured to convey electric power between the hydraulic fracturing unit and one or more of a remote electrical power source or one or more additional hydraulic fracturing units. The power cable assembly may include a length of power cable and a power cable storage apparatus connected to the hydraulic fracturing unit and configured to store the length of power cable when not in use and facilitate deployment of at least a portion of the length of power cable for use.

[0010] According to some embodiments, a hydraulic fracturing system may include a plurality of hydraulic fracturing units. The hydraulic fracturing system may include a main fuel line configured to supply fuel from a fuel source to a plurality of hydraulic fracturing units. The hydraulic fracturing system may also include a first hydraulic fracturing unit including a chassis, a pump connected to the chassis and configured to pump fracturing fluid, and a first gas turbine engine connected to the chassis and configured to convert fuel into a power output for operating the pump. The hydraulic fracturing system may also include a system for supplying fuel, enabling communications, and conveying electric power associated with operation of the first hydraulic fracturing unit. The system may include a fuel line connection assembly connected to the first

hydraulic fracturing unit and configured to supply fuel from the fuel source to the first gas turbine engine. The fuel line connection assembly may include a manifold line defining an inlet end, an outlet end, and a flow path for fuel extending between the inlet end and the outlet end. The manifold line may be configured to provide at least a portion of a flow path for supplying fuel to the first gas turbine engine. The fuel line connection assembly may be configured to one of: (1) provide flow communication between one of the main fuel line or a second gas turbine engine of a second hydraulic fracturing unit upstream of the first gas turbine engine and a third gas turbine engine of a third hydraulic fracturing unit downstream of the first gas turbine engine; or (2) provide flow communication solely between the main fuel line and the first gas turbine engine. The system may also include a communications cable assembly including a length of communications cable connected to the first hydraulic fracturing unit and configured to enable data communications between the first hydraulic fracturing unit and one of a data center remote from the first hydraulic fracturing unit or one or more additional hydraulic fracturing units of the plurality of hydraulic fracturing units. The system may also include a power cable assembly including a length of power cable connected to the first hydraulic fracturing unit and configured to convey electric power between the first hydraulic fracturing unit and one or more of a remote electrical power source or one or more additional hydraulic fracturing units of the plurality of hydraulic fracturing units. The hydraulic fracturing system may also include a data center configured to one or more of transmit communications signals or receive communications signals. The communications signals may include data indicative of operation of one or more of the plurality of hydraulic fracturing units.

[0011] Still other aspects, embodiments, and advantages of these exemplary embodiments and embodiments, are discussed in detail below. Moreover, it is to be understood that both the foregoing information and the following detailed description provide merely illustrative examples of various aspects and embodiments, and are intended to provide an overview or framework for understanding the nature and character of the claimed aspects and embodiments. Accordingly, these and other objects, along with advantages and features of the present invention herein disclosed, will become apparent through reference to the following description and the accompanying drawings. Furthermore, it is to be understood that the features of the various embodiments described herein are not mutually exclusive and can exist in various combinations and permutations.

Brief Description of the Drawings

[0012] The accompanying drawings, which are included to provide a further understanding of the embodiments of the present disclosure, are incorporated in and constitute a part of this specification, illustrate embodiments of the present disclosure, and together with the detailed description, serve to explain principles of the embodiments discussed herein. No attempt is made to show structural details of this disclosure in more detail than can be necessary for a fundamental understanding of the embodiments discussed herein and the various ways in which they can be practiced. According to common practice, the various features of the drawings discussed below are not necessarily drawn to scale. Dimensions of various features and elements in the drawings can be expanded or reduced to more clearly illustrate embodiments of the disclosure.

[0013] FIG. 1 schematically illustrates an example fuel delivery system for supplying fuel to a plurality of hydraulic fracturing units, including a detailed schematic view of an example fuel line connection assembly according to embodiments of the disclosure.

[0014] FIG. 2A is a schematic view of an example fuel line connection assembly in an example first condition for operation of a gas turbine engine according to embodiments of the disclosure.

[0015] FIG. 2B is a schematic view of the example fuel line connection assembly shown in FIG. 2A in an example second condition during an example pressure testing procedure.

[0016] FIG. 3 is a perspective view of an example fuel line connection assembly according to embodiments of the disclosure.

[0017] FIG. 4 is a schematic diagram showing an example fuel delivery system for supplying fuel to a plurality of hydraulic fracturing units according to embodiments of the disclosure.

[0018] FIG. 5 is a schematic diagram showing another example fuel delivery system for supplying fuel to a plurality of hydraulic fracturing units according to embodiments of the disclosure.

[0019] FIG. 6 is a schematic diagram showing a further example fuel delivery system for supplying fuel to a plurality of hydraulic fracturing units according to embodiments of the disclosure.

[0020] FIG. 7 is a schematic diagram showing another example fuel delivery system for supplying fuel to a plurality of hydraulic fracturing units according to embodiments of the disclosure.

[0021] FIG. 8 is a block diagram of an example method for pressure testing at least a portion of an example fuel delivery system for supplying fuel from a fuel source to a plurality of gas turbine engines according to embodiments of the disclosure.

[0022] FIG. 9 is a schematic diagram showing an example system for supplying fuel, enabling communications, and conveying electric power associated with operation of a plurality of hydraulic fracturing units according to embodiments of the disclosure.

[0023] FIG. 10 is a schematic diagram showing another example system for supplying fuel, enabling communications, and conveying electric power associated with operation of a plurality of hydraulic fracturing units according to embodiments of the disclosure.

[0024] FIG. 11 is a schematic diagram showing a further example system for supplying fuel, enabling communications, and conveying electric power associated with operation of a plurality of hydraulic fracturing units according to embodiments of the disclosure.

[0025] FIG. 12 is a schematic diagram showing another example system for supplying fuel, enabling communications, and conveying electric power associated with operation of a plurality of hydraulic fracturing units according to embodiments of the disclosure.

[0026] FIG. 13 is a schematic diagram showing a further example system for supplying fuel, enabling communications, and conveying electric power associated with operation of a plurality of hydraulic fracturing units according to embodiments of the disclosure.

[0027] FIG. 14 is a schematic diagram showing another example system for supplying fuel, enabling communications, and conveying electric power associated with operation of a plurality of hydraulic fracturing units according to embodiments of the disclosure.

[0028] FIG. 15 is a schematic diagram showing a further example system for supplying fuel, enabling communications, and conveying electric power associated with operation of a plurality of hydraulic fracturing units according to embodiments of the disclosure.

[0029] FIG. 16 is a schematic diagram showing another example system for supplying fuel, enabling communications, and conveying electric power associated with operation of a plurality of hydraulic fracturing units according to embodiments of the disclosure.

[0030] FIG. 17A is a perspective view of an example quick connect coupling for coupling two fuel lines to one another shown in an uncoupled condition according to embodiments of the disclosure.

[0031] FIG. 17B is a perspective view of the example quick connect coupling shown in FIG. 17A shown in a coupled condition according to embodiments of the disclosure.

[0032] FIG. 17C is a perspective view of another example quick connect coupling for coupling two fuel lines to one another shown in an uncoupled condition according to embodiments of the disclosure.

[0033] FIG. 18 is a perspective view of an example communications coupling for a communications cable according to embodiments of the disclosure.

[0034] FIG. 19 is a perspective view of an example power coupling for coupling a power cable shown in an uncoupled condition according to embodiments of the disclosure.

Detailed Description

[0035] Referring now to the drawings in which like numerals indicate like parts throughout the several views, the following description is provided as an enabling teaching of exemplary embodiments, and those skilled in the relevant art will recognize that many changes can be made to the embodiments described. It also will be apparent that some of the desired benefits of the embodiments described can be obtained by selecting some of the features of the embodiments without utilizing other features. Accordingly, those skilled in the art will recognize that many modifications and adaptations to the embodiments described are possible and can even be desirable in certain circumstances. Thus, the following description is provided as illustrative of the principles of the embodiments and not in limitation thereof.

[0036] The phraseology and terminology used herein is for the purpose of description and should not be regarded as limiting. As used herein, the term “plurality” refers to two or more items or components. The terms “comprising,” “including,”

“carrying,” “having,” “containing,” and “involving,” whether in the written description or the claims and the like, are open-ended terms, i.e., to mean “including but not limited to,” unless otherwise stated. Thus, the use of such terms is meant to encompass the items listed thereafter, and equivalents thereof, as well as additional items. The transitional phrases “consisting of” and “consisting essentially of,” are closed or semi-closed transitional phrases, respectively, with respect to any claims. Use of ordinal terms such as “first,” “second,” “third,” and the like in the claims to modify a claim element does not by itself connote any priority, precedence, or order of one claim element over another or the temporal order in which acts of a method are performed, but are used merely as labels to distinguish one claim element having a certain name from another element having a same name (but for use of the ordinal term) to distinguish claim elements.

[0037] FIG. 1 schematically illustrates an example fuel delivery system 10 for supplying fuel to a plurality of hydraulic fracturing units 12, including a detailed schematic view of an example fuel line connection assembly 14 according to embodiments of the disclosure. The fuel delivery system 10 may be part of a hydraulic fracturing system 16 that includes a plurality (or fleet) of hydraulic fracturing units 12 configured to pump a fracking fluid into a well at high pressure and high flow rates, so that a subterranean formation fails and begins to fracture in order to promote hydrocarbon production from the well.

[0038] In some examples, one or more of the hydraulic fracturing units 12 may include directly driven turbine (DDT) pumping units, in which pumps 18 are connected to one or more gas turbine engines (GTEs) 20 that supply power to the respective pump 18 for supplying fracking fluid at high pressure and high flow rates to a formation. For

example, a GTE 20 may be connected to a respective pump 18 via a reduction transmission connected to a drive shaft, which, in turn, is connected to an input shaft or input flange of a respective reciprocating pump 18. Other types of GTE-to-pump arrangements are contemplated. In some examples, one or more of the GTEs 20 may be a dual-fuel or bi-fuel GTE, for example, capable of being operated using of two or more different types of fuel, such as natural gas and diesel fuel, although other types of fuel are contemplated. For example, a dual-fuel or bi-fuel GTE may be capable of being operated using a first type of fuel, a second type of fuel, and/or a combination of the first type of fuel and the second type of fuel. For example, the fuel may include compressed natural gas (CNG), natural gas, field gas, pipeline gas, methane, propane, butane, and/or liquid fuels, such as, for example, diesel fuel (e.g., #2 Diesel), bio-diesel fuel, bio-fuel, alcohol, gasoline, gasohol, aviation fuel, etc. Gaseous fuels may be supplied by CNG bulk vessels, a gas compressor, a liquid natural gas vaporizer, line gas, and/or well-gas produced natural gas. Other types and sources of fuel are contemplated. The one or more GTEs 20 may be operated to provide horsepower to drive via a transmission one or more of the pumps 18 to safely and successfully fracture a formation during a well stimulation project.

[0039] Although not shown in FIG. 1, the hydraulic fracturing system 16 may include a plurality of water tanks for supplying water for a fracking fluid, one or more chemical tanks for supplying gels or agents for adding to the fracking fluid, and a plurality of proppant tanks (e.g., sand tanks) for supplying proppants for the fracking fluid. The hydraulic fracturing system 16 may also include a hydration unit for mixing water from the water tanks and gels and/or agents from the chemical tank to form a mixture, for example,

gelled water. The hydraulic fracturing system 16 may also include a blender, which receives the mixture from the hydration unit and proppants via conveyers from the proppant tanks. The blender may mix the mixture and the proppants into a slurry to serve as fracking fluid for the hydraulic fracturing system 16. Once combined, the slurry may be discharged through low-pressure hoses, which convey the slurry into two or more low-pressure lines in a frac manifold 24, as shown in FIG. 1. Low-pressure lines in the frac manifold 24 feed the slurry to the plurality of pumps 18 shown in FIG. 1 through low-pressure suction hoses.

[0040] FIG. 1 shows an example fuel delivery system 10 associated with a plurality, or fleet, of example hydraulic fracturing units 12 according to embodiments of the disclosure, identified as 12a, 12b, 12c, 12d, 12e, 12f, 12g, and 12h, although fewer or more hydraulic fracturing units 12 are contemplated. In the example shown, each of the plurality hydraulic fracturing units 12 includes a GTE 20, identified respectively as 20a, 20b, 20c, 20d, 20e, 20f, 20g, and 20h. Each of the GTEs 20 supplies power for each of the hydraulic fracturing units 12 to operate a pump 18, identified respectively as 18a, 18b, 18c, 18d, 18e, 18f, 18g, and 18h.

[0041] The pumps 18 are driven by the GTEs 20 of the respective hydraulic fracturing units 12 and discharge the slurry (e.g., the fracking fluid including the water, agents, gels, and/or proppants) at high pressure and/or a high flow rates through individual high-pressure discharge lines 26 into two or more high-pressure flow lines 28, sometimes referred to as “missiles,” on the frac manifold 24. The flow from the flow lines 28 is combined at the frac manifold 24, and one or more of the flow lines 28 provide flow communication with a manifold assembly, sometimes referred to as a “goat head.” The

manifold assembly delivers the slurry into a wellhead manifold, sometimes referred to as a “zipper manifold” or a “frac manifold.” The wellhead manifold may be configured to selectively divert the slurry to, for example, one or more well heads via operation of one or more valves. Once the fracturing process is ceased or completed, flow returning from the fractured formation discharges into a flowback manifold, and the returned flow may be collected in one or more flowback tanks.

[0042] In the example shown in FIG. 1, one or more of the components of the hydraulic fracturing system 16 may be configured to be portable, so that the hydraulic fracturing system 16 may be transported to a well site, assembled, operated for a relatively short period of time, at least partially disassembled, and transported to another location of another well site for use. In the example shown in FIG.1, each of the pumps 18 and GTEs 20 of a respective hydraulic fracturing unit 12 may be connected to (e.g., mounted on) a chassis 30, identified respectively as 30a, 30b, 30c, 30d, 30e, 30f, 30g, and 30h. In some examples, the chassis 30 may include a trailer (e.g., a flat-bed trailer) and/or a truck body to which the components of a respective hydraulic fracturing unit 12 may be connected. For example, the components may be carried by trailers and/or incorporated into trucks, so that they may be easily transported between well sites.

[0043] As shown in FIG. 1, the example fuel delivery system 10 may include a plurality of fuel line connection assemblies 14, for example, for facilitating the supply of fuel from the fuel source 22 to each of the GTEs 20 of the hydraulic fracturing system 16. In some examples, for example, as shown in FIGS. 1, 2A, 2B, and 3, one or more of the fuel line connection assemblies 14 may include a manifold line 32 defining an inlet end 34, an outlet end 36, and a flow path 38 for fuel extending between the inlet end 36 and

the outlet end 38. In addition, the fuel line connection assemblies 14 may include an inlet coupling 40 proximate the inlet end 34 and configured to be connected to a fuel line 42 providing flow communication with the fuel source 22, and an outlet coupling 44 proximate the outlet end 36 and configured to be connected to an inlet end of another manifold line or a blocking device configured to prevent flow from the outlet end 36 of the manifold line 32, for example, as explained in more detail herein.

[0044] For example, as shown in FIG. 1, the fuel delivery system 10 may include a fuel line connection assembly 14 associated with each of the hydraulic fracturing units 12a through 12h. In the example configuration shown in FIG. 1, a first hydraulic fracturing unit 12a may be in flow communication with the fuel source 22 via the fuel line 42 (e.g., via fuel line 42a). The inlet coupling 40 of the first hydraulic fracturing unit 12a may be coupled to the fuel line 42a. The outlet coupling 44 for the first hydraulic fracturing unit 12a may be coupled to an inlet coupling of a manifold line of a second hydraulic fracturing unit 12b. Similarly, the outlet coupling of the second hydraulic fracturing unit 12b may be coupled to the inlet coupling of a manifold line of a third hydraulic fracturing unit 12c. The outlet coupling of the manifold line of the third hydraulic fracturing unit 12c may be coupled to an inlet coupling of a manifold line of a fourth hydraulic fracturing unit 12d.

[0045] In the example shown, the first through fourth hydraulic fracturing units 12a through 12d may make up a first bank 46 of the hydraulic fracturing units 12, and fifth through eighth hydraulic fracturing units 12e through 12h may make up a second bank 48 of the hydraulic fracturing units 12. In some examples, for example, as shown in FIG. 1, a fifth hydraulic fracturing unit 12e may be in flow communication with the fuel source 22 via the fuel line 42 (e.g., via fuel line 42b). The inlet coupling of the fifth hydraulic

fracturing unit 12e may be coupled to the fuel line 42. The outlet coupling for the fifth hydraulic fracturing unit 12e may be coupled to an inlet coupling of a manifold line of a sixth hydraulic fracturing unit 12f. Similarly, the outlet coupling of the sixth hydraulic fracturing unit 12f may be coupled to an inlet coupling of a manifold line of a seventh hydraulic fracturing unit 12g. The outlet coupling of the manifold line of the seventh hydraulic fracturing unit 12g may be coupled to an inlet coupling of a manifold line of an eighth hydraulic fracturing unit 12h. The example fuel delivery system 10 shown in FIG. 1 may sometimes be referred to as a “daisy-chain” arrangement.

[0046] In this example manner, the fuel source 22 may supply fuel to the GTEs 20 of the hydraulic fracturing units 12. In some examples, fuel that reaches the end of the first bank 46 of the hydraulic fracturing units 12 remote from the fuel source 22 (e.g., the fourth hydraulic fracturing unit 12d) and/or fuel that reaches the end of the second bank 48 of the hydraulic fracturing units 12 remote from the fuel source 22 (e.g., the eighth hydraulic fracturing unit 12h) may be combined and/or transferred between the first bank 46 and the second bank 48, for example, via a transfer line 50 configured to provide flow communication between the first bank 46 and the second bank 48. For example, unused fuel supplied to either of the first bank 46 or the second bank 48 of hydraulic fracturing units 12 may be passed to the other bank of the two banks.

[0047] In some examples, the inlet coupling 40 and/or the outlet coupling 44 may include a flange configured to be secured to another flange of another manifold line and/or a fuel line. For example, the manifold line 32 may be a four-inch schedule 40 steel pipe, and the inlet coupling 40 and/or the outlet coupling 44 may include a four-inch 300 class weld neck flange, although other manifold line types and sizes are contemplated, as well

as other coupling types and sizes. In some examples, the inlet coupling 40 may include a quick connect coupling configured to connect the inlet end 34 of the manifold line 32 in a fluid-tight manner with a quick connect coupling (e.g., a complimentary coupling) of an outlet end of another manifold line. In some examples, the outlet coupling 44 may include quick connect coupling configured to connect the outlet end 36 of the manifold line 32 in a fluid-tight manner with a quick connect coupling of an inlet end of yet another manifold line and/or a quick connect coupling of a blocking device configured to prevent flow from the outlet end 36 of the manifold line 32, for example, to effectively prevent flow through the manifold line 32 to another hydraulic fracturing unit 12 of a common hydraulic fracturing system 16. In some examples, the quick connect coupling may include a quarter-turn quick connect (e.g., a twister locking quick connect) or a safety quick coupler (e.g., transfer-loading safety quick coupling), for example, as disclosed herein with respect to FIGS. 17A, 17B, and 17C.

[0048] In addition, as shown in FIGS. 1, 2A, 2B, and 3, the fuel line connection assemblies 14 may include a distribution line 52 connected to the manifold line 32 and configured to provide flow communication between the manifold line 32 and a GTE 20 of the respective hydraulic fracturing unit 12. In some examples, the fuel line connection assembly 14 may also include a valve 54 in the manifold line 32 or the distribution line 52 and configured to change between an open condition through which fluid flows and a closed condition preventing fluid flow. In some examples, the valve 54 may be configured to facilitate flow communication or prevent flow communication between the fuel source 22 and the GTE 20. For example, the valve 54 may be configured to change to the closed condition to prevent flow of fuel to the corresponding GTE 20, for example, to cease

operation of the GTE 20 and/or during testing related to portions of the fuel delivery system 20.

[0049] As shown in FIGS. 1, 2A, 2B, and 3, some examples, of the fuel line connection assembly 14 may also include a sensor 56 disposed in the manifold line 32 (e.g., upstream relative to the distribution line 52) or the distribution line 52 and configured to generate a signal indicative of pressure associated with flow of fuel to the GTE 20 of the respective hydraulic fracturing unit 12. The sensor 56 may include any transducer configured to generate a signal indicative of pressure in the manifold line 32 and/or the distribution line 52. As shown in FIG. 1, some examples of the fuel line connection assembly 14 may include a pressure gauge 58 in flow communication with the manifold line 32 downstream of the distribution line 52, for example, configured to provide an indication of the pressure in the manifold line 32, for example, for an operator of the hydraulic fracturing system 16. The pressure gauge 58 may be any type of gauge configured to generate an indication of the pressure in the manifold line 32 downstream of the distribution line 52. In some examples, the indication of pressure may be viewed at a location remote from the manifold line 32, for example, at an operations console associated with the hydraulic fracturing operation.

[0050] As shown in FIGS. 1, 2A, and 2B, the fuel line connection assembly 14 may also include a filter 60 disposed in the distribution line 52 between the manifold line 32 and the GTE 20 and configured to filter one or more of particulates or liquids from fuel in flow communication with the GTE 20. For example, as shown in FIG. 3, the filter 60 may include a first filter 60a configured to remove particulates from fuel supplied to the GTE 20 and a second filter 60b (e.g., a coalescing filter) configured to remove liquids from the

fuel line connection assembly 14 before fuel reaches the GTE 20. This may improve performance of the GTE 20 and/or reduce maintenance and/or damage to the GTE 20 due to contaminants in the fuel.

[0051] As shown in FIG. 1, some examples of the fuel line connection assembly 14 may also include a sensor 62 disposed in the distribution line 52 between the filter 60 and the GTE 20 of the respective hydraulic fracturing unit 12. The sensor 62 may be configured to generate a signal indicative of pressure associated with flow of fuel between the filter 60 and the GTE 20. The sensor 56 and/or the sensor 62, upstream and downstream, respectively, of the filter 60, may be used to determine a pressure differential across the filter 60, which, if higher than a predetermined pressure, may be an indication that the filter 60 is inhibiting fuel flow through the filter 60, which may be an indication that the filter 60 should be cleaned, serviced, and/or replaced.

[0052] In some examples, the fuel line connection assembly 14 may be configured to facilitate testing for leaks in at least a portion of the fuel delivery system 10 according to some embodiments of the disclosure. For example, as shown in FIGS. 1, 2A, 2B, and 3, the fuel line connection assembly 14 may be configured to perform a pressure test to identify leaks in at least a portion of the fuel delivery system 10. For example, the valve 54 may be a first valve 54, and the fuel line connection assembly 14 may further include a second valve 64 disposed in the distribution line 52 and configured to change between an open condition through which fluid flows and a closed condition preventing fluid flow. The second valve 64 may be configured facilitate flow communication or prevent flow communication between the filter 60 and the GTE 20 of the respective hydraulic fracturing unit 12. The fuel line connection assembly 14 may also include a test line 66 in flow

communication with the distribution line 52 between the filter 60 and the GTE 20 and configured to provide flow communication between a pressure source 68 and the filter 60. In some examples, the fuel line connection assembly 14 may also include a third valve 70 disposed in the test line 66 and configured to change between an open condition through which fluid flows and a closed condition preventing fluid flow. The third valve 70 may be configured to facilitate flow communication or prevent flow communication between the pressure source 68 and the filter 60. In some examples, the fuel line connection assembly 14 may further include a fourth valve 72 disposed between the pressure source 68 and the filter 60 and configured to change between an open condition through which fluid flows and a closed condition preventing fluid flow. The fourth valve 72 may be configured to release pressure in the test line 66 between the pressure source 68 and the third valve 70, for example as disclosed herein. One or more of the first valve 54, the second valve 64, the third valve 70, or the fourth valve 72 may be a ball valve, although other types of valves are contemplated.

[0053] As shown in FIGS. 1, 2A, 2B, and 3, the fuel line connection assembly 14 may also include a controller 74 configured to facilitate pressure testing at least a portion of the fuel delivery system 10 and in communication with one or more of the sensors 56 and 62 configured to generate signals indicative of pressure, one or more of the first valve 54, the second valve 64, the third valve 70, or the fourth valve 72, and the pressure source 68. In some examples, the controller 74 may be configured to cause operation of one or more of the first valve 54, the second valve 64, the third valve 70, or the fourth valve 72, and receive one or more signals from one or more of the sensors 56 and 62. Based at least in part on the one or more signals, the controller 74 may be configured to determine

the presence of a leak in at least a portion of the fuel delivery system 14 and/or the fuel line connection assembly 14, for example, semi- or fully-autonomously.

[0054] For example, as shown in FIG. 3, the fuel line connection assembly 14 may include one or more actuators connected respectively to one or more of the first valve 54, the second valve 64, the third valve 70, or the fourth valve 72 and configured cause one or more of the first valve 54, the second valve 64, the third valve 70, or the fourth valve 72 to change conditions, for example, between an open condition and a closed condition. As shown, a first actuator 76, a second actuator 78, a third actuator 80, and a fourth actuator 82 are respectively connected to the first valve 54, the second valve 64, the third valve 70, and the fourth valve 72, and are configured to control the condition of the respective valve. As explained below, by coordinated activation of the first actuator 76, second actuator 78, third actuator 80, and/or fourth actuator 82, and in some examples, control of the pressure source 68, the controller 74 may be configured to pressure test at least a portion of the fuel delivery system 14 and/or one or more of the fuel line connection assemblies 14 of the fuel delivery system 10, for example, to identify leaks in at least a portion of the fuel delivery system 14, including one or more of the fuel line connection assemblies 14 of the fuel delivery system 10.

[0055] For example, FIG. 2A is a schematic view of an example fuel line connection assembly 14 in an example first condition for operation of the GTE 20 according to embodiments of the disclosure. As shown in FIG. 2A, the first valve 54 and the second valve 64 are in the open condition, such that fuel from the fuel source 22 flows via the fuel line 42, into the inlet end 34 of the manifold line 32 of the fuel line connection assembly 14, into the distribution line 52, through the first valve 54, through the filter 60, and through

the second valve 64 to the GTE 20 for combustion to drive the pump 18 connected to the GTE 20. As shown in FIG. 2A, the third valve 70 and the fourth valve 72 are in the closed condition preventing fuel flow through those valves and/or preventing pressure from the pressure source 68 from entering the fuel line connection assembly 14 through the third valve 70. In some examples, the controller 74 may be configured to communicate with the first actuator 76, second actuator 78, third actuator 80, and/or fourth actuator 82 (see FIG. 3) to cause the respective valves to have the above-noted conditions (e.g., open or closed).

[0056] FIG. 2B is a schematic view of the example fuel line connection assembly 14 shown in FIG. 2A in an example second condition during a portion of an example pressure testing procedure. As shown in FIG. 2B, to perform a pressure test according to some embodiments of the disclosure, the controller 74 may be configured to cause the first valve 54 to be in the open condition, cause the second valve 64 to be in the closed condition, cause the third valve 70 to be in the open condition, and cause the pressure source 68 to increase pressure in one or more of the distribution line 52 or the manifold line 32. The controller 74 may be further configured to determine the presence of a leak in the fuel line connection assembly 14 based at least in part on signals indicative of pressure received from the sensor 62 between the pressure source 68 and the filter 60 and/or the sensor 56 between the filter 60 and the fuel source 22. For example, as explained in more detail herein with respect to FIG. 8, the controller 74 may be configured to cause (or allow) the pressure source 68 to cause an increase in pressure (or at least attempt to cause an increase in pressure) in the fuel line connection assembly 14 and/or at least portions of the fuel delivery system 10. Depending at least in part on whether a

threshold pressure in the fuel line connection system 14 and/or the fuel delivery system 10 can be achieved, how quickly the threshold pressure is achieved, and/or once the threshold pressure is achieved, how long and/or how much of the threshold pressure is maintained, the controller 74 may be configured to determine whether a leak in the fuel line connection assembly 14 and/or the fuel delivery system 10 exists, and generate a signal indicative of the leak. In some examples, increasing pressure via the pressure source 68 in at least a portion of the fuel delivery system 10 and/or fuel line connection assembly 14 may include activating a compressor in flow communication with at least a portion of the fuel delivery system 10 and/or fuel line connection assembly 14 through the third valve 70 and/or opening a valve of a pressurized cylinder in flow communication with at least a portion of the fuel delivery system 10 and/or the fuel line connection assembly 14 through the third valve 70. In some examples, the pressure source 68 may include a cascade gas system, and in some examples, the pressurized gas may include nitrogen, argon, neon, helium, krypton, xenon, radon, and/or carbon dioxide, although other gases are contemplated. In some examples, the controller 74 may include one or more industrial control systems (ICS), such as, for example, supervisory control and data acquisition (SCADA) systems, distributed control systems (DCS), micro controllers, and/or programmable logic controllers (PLCs).

[0057] In some examples, once the testing is complete, or in order to cease the testing, the controller 74 may be configured to cause the third valve 70 to change from the open condition to the closed condition, for example, via activation of the third actuator 80, and cause the fourth valve 72 to change from the closed condition to the open condition, for example, via activation of the fourth actuator 82, to thereby close-off the

pressure source 68 and/or bleed any remaining excess pressure between the pressure source 68 and the third valve 70. The controller 74 may also cause the second valve 64 to return to the open condition, for example, via activation of the second actuator 78, and/or ensure that the first valve 54 remains in the open condition (see FIG. 2A), thereby causing the fuel delivery system 10 and/or the fuel line connection assembly 14 to be in a condition to supply fuel from the fuel source 22 for operation of the GTE 20.

[0058] FIG. 4 is a schematic diagram showing an example fuel delivery system 10 for supplying fuel to a plurality of hydraulic fracturing units 12 according to embodiments of the disclosure. As shown in FIG. 4, a first hydraulic fracturing unit 12a may be in flow communication with the fuel source 22 via the fuel line 42 (e.g., via a first fuel line 42a). The inlet coupling 40 of the first hydraulic fracturing unit 12a may be coupled to the fuel line 42a. The outlet coupling 44 for the first hydraulic fracturing unit 12a may be coupled to an inlet coupling of a manifold line of a second hydraulic fracturing unit 12b. Similarly, the outlet coupling of the second hydraulic fracturing unit 12b may be coupled to the inlet coupling of a manifold line of a third hydraulic fracturing unit 12c. The outlet coupling of the manifold line of the third hydraulic fracturing unit 12c may be coupled to an inlet coupling of a manifold line of a fourth hydraulic fracturing unit 12d.

[0059] In the example shown, the first through fourth hydraulic fracturing units 12a through 12d may make up a first bank 46 of the hydraulic fracturing units 12, and fifth through eighth hydraulic fracturing units 12e through 12h may make up a second bank 48 of the hydraulic fracturing units 12. In some examples, for example as shown in FIG. 1, a fifth hydraulic fracturing unit 12e may be in flow communication with the fuel source 22 via the fuel line 42 (e.g., via a second fuel line 42b). The inlet coupling of the fifth

hydraulic fracturing unit 12e may be coupled to the fuel line 42b. The outlet coupling for the fifth hydraulic fracturing unit 12e may be coupled to an inlet coupling of a manifold line of a sixth hydraulic fracturing unit 12f. Similarly, the outlet coupling of the sixth hydraulic fracturing unit 12f may be coupled to an inlet coupling of a manifold line of a seventh hydraulic fracturing unit 12g. The outlet coupling of the manifold line of the seventh hydraulic fracturing unit 12g may be coupled to an inlet coupling of a manifold line of an eighth hydraulic fracturing unit 12h. The example fuel delivery system 10 shown in FIG. 4 may sometimes be referred to as a “daisy-chain” arrangement.

[0060] FIG. 5 is a schematic diagram showing another example fuel delivery system 10 for supplying fuel to a plurality of hydraulic fracturing units 12 according to embodiments of the disclosure. As shown in FIG. 5, the inlet end 34 of the manifold line 32 of the first hydraulic fracturing unit 12a is connected to an outlet 84 of a main fuel line 86a, which is connected to a hub 88 (e.g., a fuel hub). Rather than being connected to an inlet end of another manifold line of the second hydraulic fracturing unit 12b as in FIG. 4, the outlet end 36 of the manifold line 32 of the first hydraulic fracturing unit 12a is connected to a blocking device (not shown) configured to prevent flow from the outlet end 36 of the manifold line 32 of the first hydraulic fracturing unit 12a. The inlet ends of the respective manifold lines of the second hydraulic fracturing unit 12b, the third hydraulic fracturing unit 12c, the fourth hydraulic fracturing unit 12d, the fifth hydraulic fracturing unit 12e, the sixth hydraulic fracturing unit 12f, the seventh hydraulic fracturing unit 12g, and the eighth hydraulic fracturing unit 12h (and/or more hydraulic fracturing units) are connected to the hub 88 via respective main fuel lines 86b, 86c, 86d, 86e, 86f, 86g, and 86h. The outlet ends of the manifold lines of the second through eighth hydraulic

fracturing units 12b through 12h are each connected to a blocking device (not shown) configured to prevent flow from the outlet ends of the respective manifold lines. The example fuel delivery system 10 shown in FIG. 5 may sometimes be referred to as a “hub and spoke” arrangement.

[0061] FIG. 6 is a schematic diagram showing a further example fuel delivery system 10 for supplying fuel to a plurality of hydraulic fracturing units 12 according to embodiments of the disclosure. The example fuel delivery system shown in FIG. 6 is similar to the example fuel delivery system shown in FIG. 5, except that the fuel delivery system 10 includes two hubs 90a and 90b (e.g., fuel hubs). A first one of the hubs 90a is connected to the fuel source 22 via a first fuel line 42, and a second hub 90b is connected to the fuel source 22 via a second fuel line 42b. The first hub 90a may supply fuel to one or more (e.g., each) of the GTEs 20 of the first bank 46 of hydraulic fracturing units 12, and the second hub 90b may supply fuel to one or more (e.g., each) of the GTEs 20 of the second bank 48 of hydraulic fracturing units 12. More than two hubs are contemplated. The example fuel delivery system 10 shown in FIG. 5 may sometimes be referred to as a “hub and spoke” arrangement, with two or more hubs.

[0062] FIG. 7 is a schematic diagram showing another example fuel delivery system 10 for supplying fuel to a plurality of hydraulic fracturing units 12 according to embodiments of the disclosure. The example fuel delivery system 10 shown in FIG. 7 includes a fuel manifold 92, and the example fuel manifold 92 receives fuel from the fuel source 22 via a first fuel line 42a and a second fuel line 42b, with the first fuel line 42a supplying fuel to the GTEs 20 of the first bank 46 of hydraulic fracturing units 12, and the second fuel line 42b supplying fuel for the GTEs 20 of the second bank 48 of hydraulic

fracturing units 12. In some examples, the inlet end 34 of the manifold line 32 of the first hydraulic fracturing unit 12a is connected to a respective outlet of the fuel manifold 92 (e.g., a first bank 94a of the fuel manifold 92 the or main fuel line). In the example shown, the outlet end 36 of the manifold line 32 of the first hydraulic fracturing unit 12a is connected to a blocking device (not shown) configured to prevent flow from the outlet end 36 of the manifold line 32 of the first hydraulic fracturing unit 12a. The inlet ends of the respective manifold lines of the second hydraulic fracturing unit 12b, the third hydraulic fracturing unit 12c, and the fourth hydraulic fracturing unit 12d are connected to the first bank 94a of the fuel manifold 92. The outlet ends of the manifold lines of the second through fourth hydraulic fracturing units 12b through 12d are each connected to a blocking device (not shown) configured to prevent flow from the outlet ends of the respective manifold lines. In the example shown in FIG. 7, the inlet ends of the respective manifold lines of the fifth hydraulic fracturing unit 12e through the eighth hydraulic fracturing unit 12h are connected to respective outlets of the fuel manifold 92 (e.g., a second bank 94b of the fuel manifold 92 or main fuel line). In the example shown, the outlet ends of the respective manifold lines of the fifth through eighth hydraulic fracturing units 12e through 12h are each connected to a blocking device (not shown) configured to prevent flow from the outlet ends of the respective manifold lines of the fifth through eighth hydraulic fracturing units 12e through 12h. In some examples, the fuel manifold 92 may be connected to a trailer for portability. The example fuel delivery system 10 shown in FIG. 7 may sometimes be referred to as a “combination” arrangement.

[0063] In some examples, the configuration of the fuel line connection assemblies 14 may facilitate arranging the hydraulic fracturing units in (1) a “daisy-chain”

arrangement, in which fuel passes through each of manifold lines 32 in a series-type arrangement, (2) a “hub and spoke” arrangement, in which an inlet end of each of the manifold lines 32 is connected to a fuel line from a fuel hub or the fuel source and flow from an outlet end is prevented, or (3) a “combination” arrangement, such as the example shown in FIG. 7, which may include connection of the inlet ends of the manifold lines 32 to a fuel manifold 92. Different arrangements may be desirable depending on a number of factors associated with the fracturing operation, and the flexibility of arrangements provided by at least some examples of the fuel delivery system 10 may reduce the need for multiple sets of parts to achieve each of the different arrangements. In addition, the couplings provided by the manifold lines 32, at least according to some embodiments, may reduce the time and complexity associated with setting-up and/or breaking-down the hydraulic fracturing system 16. In some examples, the number and/or types of tools required to set-up and/or break-down the hydraulic fracturing system 16 may also be reduced.

[0064] FIG. 8 is a block diagram of an example method 800 for pressure testing at least a portion of a fuel delivery system for supplying fuel from a fuel source to a plurality of GTEs according to embodiments of the disclosure, illustrated as a collection of blocks in a logical flow graph, which represent a sequence of operations that may be implemented in hardware, software, or a combination thereof. In the context of software, the blocks represent computer-executable instructions stored on one or more computer-readable storage media that, when executed by one or more processors, perform the recited operations. Generally, computer-executable instructions include routines, programs, objects, components, data structures, and the like that perform particular

functions or implement particular data types. The order in which the operations are described is not intended to be construed as a limitation, and any number of the described blocks can be combined in any order and/or in parallel to implement the methods.

[0065] FIG. 8 is a flow diagram of an example method 800 for pressure testing at least a portion of a fuel delivery system for supplying fuel from a fuel source to a plurality of GTEs, for example, associated with pumps in a hydraulic fracturing system, according to embodiments of the disclosure. In some examples, the method 800 may be performed semi- or fully-autonomously, for example, via a controller. The method 800 may be utilized in association with various systems, such as, for example, the example fuel delivery systems 10 shown in one or more of FIGS. 1, 2A, 2B, 3-7, or 9-16.

[0066] The example method 800, at 802, may include causing a first valve to be in an open condition. The first valve may be configured to facilitate flow communication or prevent flow communication between a fuel source and a GTE of the plurality of GTEs. For example, a controller may be configured to communicate with an actuator to activate the actuator to cause the first valve to be in the open condition, so that flow communication exists between the GTE and the fuel source.

[0067] At 804, the example method 800 may further include causing a second valve to be in a closed condition. The second valve may be configured to facilitate flow communication or prevent flow communication between a filter configured to filter one or more of particulates or liquids from fuel and the GTE. For example, the controller may be configured to communicate with an actuator to activate the actuator to cause the second valve to be in the closed condition, so that flow communication between the filter and the

GTE is prevented. This may effectively isolate or close-off the GTE from flow communication with the fuel delivery system and/or the remainder fuel line connection assembly (e.g., with the distribution line).

[0068] At 806, the example method 800 may also include causing a third valve to be in an open condition. The third valve may be configured to facilitate flow communication or prevent flow communication between a pressure source and the filter. For example, the controller may be configured to communicate with an actuator to activate the actuator to cause the third valve to be in the open condition, so that flow communication exists between the pressure source and the filter.

[0069] The example method 800, at 808, may further include increasing pressure via the pressure source in the at least a portion of the fuel delivery system. For example, the controller may be configured to cause the pressure source to increase pressure (or at least attempt to increase pressure) in the fuel line connection assembly and/or the fuel delivery system, for example, to determine whether the fuel line connection assembly and/or the fuel line delivery system is sufficiently leak-tight for pressure to increase to, and/or hold, a predetermined or threshold pressure for a period of time. In some examples, increasing pressure via the pressure source may include activating a compressor in flow communication with the portion of the fuel line connection assembly and/or the fuel delivery system, and/or opening a valve of a pressurized cylinder in flow communication with the portion of the fuel line connection assembly and/or the fuel delivery system.

[0070] The example method 800, at 810, may also include initiating a timer. In some examples, the controller may be configured to initiate a timer and cause the increase (or attempt to increase) the pressure until a predetermined time has elapsed.

[0071] At 812, the example method 800 may also include monitoring a signal indicative of pressure in the at least a portion of the fuel delivery system. For example, a pressure sensor in flow communication with the fuel line connection system and/or the fuel delivery system may generate one or more signals indicative of the pressure in the assembly and/or system, for example, and the controller may receive the one or more signals and determine whether the pressure increases to the predetermined or threshold pressure.

[0072] At 814, the example method 800 may further include, based at least in part on the signal, determining whether the at least a portion of the fuel delivery system has a leak. For example, the controller may receive the one or more signals from the sensor indicative of pressure in the fuel line connection assembly and/or the fuel delivery system and, based at least in part on the one or more signals, determine whether a leak exists in the fuel line connection assembly and/or the fuel delivery system. In some examples, this determination may include comparing the pressure in at least a portion of the fuel delivery system at the end of the predetermined time to a predetermined pressure, and determining whether the portion of the fuel delivery system has a leak when the pressure in the portion of the fuel delivery system is less than the predetermined pressure, or the portion of the fuel delivery system does not have a leak when the pressure in the at least a portion of the fuel delivery system is at least the predetermined pressure by the end of the predetermined time. In some examples, if it has been determined that the pressure

in the fuel delivery system has reached the predetermined pressure, for example, prior to the end of the predetermined time, the method may include initiating the timer, waiting for a second predetermined time to elapse, and comparing the pressure in the portion of the fuel delivery system at the second predetermined time to the predetermined pressure. If the pressure in the fuel delivery system remains above the predetermined pressure at the end of the second predetermined time, the controller may be configured to determine that the fuel line connection assembly and/or the fuel delivery system does not have a leak.

[0073] The example method 800, at 816, if it has been determined that the fuel delivery system has a leak, may also include generating a signal indicative of the leak. For example, if the controller determines that the fuel line connection assembly and/or the fuel delivery system has a leak, the controller may generate an alarm signal indicative of the leak that may be received by personnel at the hydraulic fracturing site, so that remedial measures may be performed. In some examples, the method may be configured to sequentially isolate fuel line connection assemblies associated with respective hydraulic fracturing units and perform a pressure test on each one of the fuel line connection assemblies associated with each of the hydraulic fracturing units. For example, the controller may be configured to cause valves of fuel line connection assemblies to be in a closed condition, so that a fuel line connection assembly being tested can be isolated and the pressure test performed for the isolated fuel line connection assembly. This process may be repeated for one or more of the other fuel line connection assemblies associated with respective hydraulic fracturing units.

[0074] The example method 800, at 818, if no leak has been determined at 814, may further include ceasing the pressure testing, for example, after one or more of the

predetermined times have elapsed and no leaks have been detected by the controller. In addition, once a leak has been detected, for example, at 814, the method 800 may also include ceasing the pressure testing. This may include isolating the pressure source from the fuel line connection assembly and/or the fuel delivery system. In some examples, this may include ceasing operation of a compressor, closing a valve on a pressure source, such as a high pressure tank, etc.

[0075] At 820, the example method 800 may include causing a fourth valve to be in an open condition. The fourth valve may be configured to release pressure in the at least a portion of the fuel delivery system, such as the fuel line connection assembly and/or the test line. The controller may communicate with an actuator associated with the fourth valve to cause the fourth valve to be in the open condition, thereby releasing pressure increased during the pressure testing from the fuel line connection assembly and/or the fuel delivery system.

[0076] At 822, the example method 800 may further include causing the third valve to be in the closed condition and causing the second valve to be in the open condition. For example, the controller may be configured to communicate with actuators associated with the second and third valves and cause the second valve to be in the open condition so that fuel from the fuel source may be supplied to the GTE and cause the third valve to be in the closed condition to prevent fuel from passing to the test line and/or the pressure source during operation of the GTE.

[0077] In some examples, once a pressure test has been initiated, the first valve will be caused to be in the open condition for example, to allow pressure from the pressure

source to fill at least a portion of the fuel delivery system (e.g., the entire fuel delivery system, including one or more fuel lines from the fuel source). The second valve will be caused to be in the closed condition and isolate the GTE from the fuel delivery system. The third valve will be caused to be in the open condition to allow pressure from the pressure source to fill the fuel delivery system and build pressure therein. The fourth valve will be caused to be in the closed condition to allow pressure to build (or attempt to build) in the fuel delivery system.

[0078] Once the first, second, third, and fourth valves are in the above-noted conditions, the pressure source will be activated to build (or attempt to build) pressure in the fuel delivery system. The sensors will generate signals indicative of the pressure in the fuel delivery system, which will be received by the controller. The controller will initiate a timer, and the pressure source will attempt to increase the pressure in the fuel delivery system to a predetermined threshold pressure for a predetermined time. The threshold pressure and/or the predetermined time may be set by an operator and/or automatically controlled via the controller according to a program. If the pressure source is unable to cause the pressure in the fuel delivery system to achieve the pressure threshold before the predetermined time has elapsed, the controller may cause the pressure source to discontinue attempting to increase the pressure in the fuel delivery system (e.g., the controller will cease operation of a compressor serving as the pressure source). The controller may also generate a signal and/or an alarm to notify an operator of a possible leak in the fuel delivery system.

[0079] If, however, the pressure in the fuel delivery system reaches the predetermined threshold pressure, the controller may cause the pressure source to

discontinue attempting to increase the pressure in the fuel delivery system. The controller may also initiate a new timer and monitor the pressure in the fuel delivery system for a second predetermined time (e.g., five minutes). If the pressure in the fuel delivery system remains stable for the duration of the second predetermined time, the controller may determine that no leaks are present in the fuel delivery system, and the pressure test may be deemed successful. If the pressure drops, for example, greater than a predetermined rate (e.g., greater than 5% during the second predetermined time), the controller may be configured to generate a signal and/or an alarm to notify an operator of a possible leak in the fuel delivery system.

[0080] At the end of the pressure test, the controller (and/or the operator) may bleed pressure from the fuel delivery system, causing the fourth valve to change to the open condition to vent the pressure from the fuel delivery system. After pressure has been bled from the fuel delivery system, the controller may cause the first, second, third, and fourth valves to change to the condition consistent with operation of the hydraulic fracturing system, for example, such that the first valve is in the open condition to allow fuel to flow from the pressure source to the filter, the second valve is in the open condition to allow fuel to flow from the filter to the GTE, such that the third valve is in the closed condition to prevent fuel from flowing to the pressure source or to the fourth valve, and such that the fourth valve is in the closed condition, so that if another pressure test is commenced, the fourth valve will prevent bleeding of the pressure from the pressure source.

[0081] It should be appreciated that subject matter presented herein may be implemented as a computer process, a computer-controlled apparatus, a computing

system, or an article of manufacture, such as a computer-readable storage medium. While the subject matter described herein is presented in the general context of program modules that execute on one or more computing devices, those skilled in the art will recognize that other implementations may be performed in combination with other types of program modules. Generally, program modules include routines, programs, components, data structures, and other types of structures that perform particular tasks or implement particular abstract data types.

[0082] Those skilled in the art will also appreciate that aspects of the subject matter described herein may be practiced on or in conjunction with other computer system configurations beyond those described herein, including multiprocessor systems, microprocessor-based or programmable consumer electronics, minicomputers, mainframe computers, handheld computers, mobile telephone devices, tablet computing devices, special-purposed hardware devices, network appliances, and the like.

[0083] FIG. 9 is a schematic diagram showing a portion of an example hydraulic fracturing system 16 including an example system 100 for supplying fuel, enabling communications, and conveying electric power associated with operation of a plurality of hydraulic fracturing units 12 according to embodiments of the disclosure. The example system 100 shown in FIG. 9 may sometimes be referred to as a “daisy-chain” arrangement. In the example shown in FIG. 9, the system 100 includes a main fuel line 86 configured to supply fuel from a fuel source 22 to the plurality of hydraulic fracturing units 12. Each of the example hydraulic fracturing units 12 includes a chassis 30 (e.g., including a trailer and/or a truck body), a pump 18 connected to the chassis 30, and a GTE 20 connected to the chassis 30 and configured to convert fuel into a power output

for operating the pump 18. In the example shown, the hydraulic fracturing units 12 are arranged into a first bank 46 of hydraulic fracturing units 12 and a second bank 48 of hydraulic fracturing units 12, and the main fuel line 86 includes a first main fuel line 86a configured to supply fuel to the first bank 46 of hydraulic fracturing units 12 and a second main fuel line 86b configured to supply fuel to the second bank 48 of the hydraulic fracturing units.

[0084] In the example system 100 shown in FIG. 9, a fuel line connection assembly 14 is provided for each of the hydraulic fracturing units to supply fuel from the fuel source 22 to each of the GTEs 20 of the respective hydraulic fracturing units 12. The respective fuel line connection assemblies 14 may include a manifold line 32 defining an inlet end 34, an outlet end 36, and a flow path 38 for fuel extending between the inlet end 34 and the outlet end 36 (see, e.g., FIGS. 1, 2A, 2B, and 3). The manifold line 32 may be configured to provide at least a portion of a flow path for supplying fuel to a first GTE 20 of the respective hydraulic fracturing unit 12. One or more of the fuel line connection assemblies 14 may be configured to provide flow communication between the main fuel line 86 or another GTE 20 (relative to the first GTE 20 associated with the fuel line connection assembly 14) of another hydraulic fracturing unit 12 upstream of the first GTE 20, and another additional GTE 20 of another additional hydraulic fracturing unit 12 downstream of the first GTE 20.

[0085] For example, as shown in FIG. 9, the fuel line connection assembly 14 associated with a first GTE 20a of a respective first hydraulic fracturing unit 12a includes a first manifold line 32a having an inlet end configured to be in flow communication with the first main fuel line 86a and an outlet end configured to be in flow communication with

an inlet end of a manifold line 32b of a second hydraulic fracturing unit 12b downstream of the first hydraulic fracturing unit 12a. The fuel line connection assembly 14 associated with a second GTE 20b of the respective second hydraulic fracturing unit 12b includes the second manifold line 32b having the inlet end configured to be in flow communication with the outlet end of the first manifold line 32a of the first hydraulic fracturing unit 12a upstream of the second hydraulic fracturing unit 12b, and an outlet end configured to be in flow communication with an inlet end of a manifold line 32c of a third hydraulic fracturing unit 12c downstream of the second hydraulic fracturing unit 12b. In some examples, this pattern may be repeated throughout the first bank 46 of hydraulic fracturing units 12a through 12d, and again throughout the second bank 48 of hydraulic fracturing units 12e through 12h.

[0086] As shown in FIG. 9, in some examples, fuel that reaches the end of the first bank 46 of the hydraulic fracturing units 12 remote from the fuel source 22 and/or fuel that reaches the end of the second bank 48 of the hydraulic fracturing units 12 remote from the fuel source 22 may be combined and/or transferred between the first bank 46 and the second bank 48, for example, via a transfer line 50 configured to provide flow communication between the first bank 46 and the second bank 48. For example, unused fuel supplied to either of the first bank 46 or the second bank 48 of hydraulic fracturing units 12 may be passed to the other bank of the two banks via the transfer line 50, thereby sharing fuel between the banks 46 and 48.

[0087] As shown in FIG. 9, the system 100 may also include, for one or more (e.g., each) of the hydraulic fracturing units 12, a communications cable assembly 102 including a length of communications cable 104 connected to a respective one of the hydraulic

fracturing units 12 and configured to enable data communications between the respective hydraulic fracturing unit 12 and a data center 106 remote from the respective hydraulic fracturing unit 12 or one or more additional hydraulic fracturing units 12.

[0088] For example, as shown FIG. 9, a data center communications cable 108 may provide a communications link between the data center 106 and a first one of the hydraulic fracturing units 12. The hydraulic fracturing unit 12 may include a length of communications cable 104 that extends to a next one of the hydraulic fracturing units 12, and that hydraulic fracturing unit 12 may include a length of communications cable 104 that extends to a next one of the hydraulic fracturing units 12. In some examples, each of the hydraulic fracturing units 12 may include a length of communications cable 104 for extending to a next one of the hydraulic fracturing units 12. In this example fashion, each of the hydraulic fracturing units 12 may be linked to one another and to the data center 104. As shown in FIG. 9, in some examples, a last-in-line hydraulic fracturing unit 12 may include a length of communications cable 104 that runs to the data center 106, thus resulting in a continuous communications link, by which one or more of the hydraulic fracturing units 12 may be in communication with the data center 104. In some examples, the data center 104 may be configured to transmit communications signals and/or receive communications signals, and the communications signals may include data indicative of operation of one or more of the plurality of hydraulic fracturing units 12, including, for example, parameters associated with operation of the pumps 18 and/or the GTEs 20, as well as additional data related to other parameters associated with operation and/or testing of one or more of the hydraulic fracturing units 12.

[0089] In some examples, the communications cable 104 may include a first end configured to be connected to a first unit interface connected to a respective hydraulic fracturing unit 12. The length of communications cable 104 may also include a second end configured to be connected to a data center interface of the data center 106 or a second unit interface connected to another one of the hydraulic fracturing units 12. One or more of the first end or the second end of the length of communications cable 104 may include or be provided with a quick connector configured to be connected to one or more of the first unit interface or the data center interface, for example, as discussed herein with respect to FIG. 18.

[0090] In some examples, the communications cable assembly 102 may also include a communications cable storage apparatus connected to the respective hydraulic fracturing unit 12 and configured to store the length of communications cable 104 when not in use and to facilitate deployment of at least a portion of the length of communications cable 104 for connection to the data center 106 or the another hydraulic fracturing unit 12. The communications cable storage apparatus may include a cable reel configured to be connected to the hydraulic fracturing unit 12 and/or a cable support configured to be connected to the hydraulic fracturing unit 12 and to receive windings of at least a portion of the length of communications cable 104.

[0091] As shown in FIG. 9, some examples of the system 100 may also include a power cable assembly 110 including a length of power cable 112 connected to one or more (e.g., each) of the hydraulic fracturing units 12 and configured to convey electric power between the hydraulic fracturing units 12 and a remote electrical power source or one or more additional hydraulic fracturing units 12 of the hydraulic fracturing system 16.

For example, as shown in FIG. 9, a length of power cable 112 is connected to each of the hydraulic fracturing units 12, and each of the lengths of power cable 112 are configured to be connected to a next-in-line hydraulic fracturing unit 12. In some examples, the length of power cable 112 may extend from one hydraulic fracturing unit 12 to another hydraulic fracturing unit 12 other than a next-in-line hydraulic fracturing unit 12. One or more of the lengths of power cable 112 may include a first end including a power plug configured to be received in a power socket, for example, as discussed herein with respect to FIG. 19.

[0092] In some examples, one or more of the power cable assemblies 110 may also include a power cable storage apparatus configured to be connected to the respective hydraulic fracturing unit 12. The power cable storage apparatus, in some examples, may be configured to store the length of power cable 112 when not in use and to facilitate deployment of at least a portion of the length of power cable 112 for use.

[0093] As shown in FIG. 9, each of the hydraulic fracturing units 12 in the example shown includes a length of power cable 112. In some such examples, each of the hydraulic fracturing units 12 is configured to supply and/or generate its own electric power, for example, by operation of a generator connected to the GTE 20 and/or to another source of mechanical power, such as another gas turbine engine or reciprocating piston engine (e.g., a diesel engine). In the example configuration shown in FIG. 9, the lengths of power cable 112 run between each of the hydraulic fracturing units 12, thus connecting all the hydraulic fracturing units 12 to one another, such that power may be shared among at least some or all of the hydraulic fracturing units 12. Thus, if one or more of the hydraulic fracturing units 12 is unable to generate its own electric power or is

unable to generate a sufficient amount of electric power to meet its operation requirements, electric power from one or more of the remaining hydraulic fracturing units 12 may be used to mitigate or overcome the electric power deficit. As shown additional lengths of power cable 114 may be included in the system 100 to supply electric power between the two banks 46 and 48 of the hydraulic fracturing units 12.

[0094] FIG. 10 is a schematic diagram showing another example system 100 for supplying fuel, enabling communications, and conveying electric power associated with operation of a plurality of hydraulic fracturing units 12 according to embodiments of the disclosure. The example system 100 shown in FIG. 10 is similar to the example system 100 shown in FIG. 9, except that the example system 100 shown in FIG. 10 includes an electrical power source 116 located remotely from each of the hydraulic fracturing units 12, for example, such that the electrical power source 116 is not mechanically connected directly to the chassis 30 of one or more of the hydraulic fracturing units 12. In some examples, the electrical power source 116 may include one or more of one or more power generation devices or one or more batteries. For example, the electrical power source 116 may include one or more gensets (e.g., including an internal combustion engine-driven electrical generator) and/or one or more electric power storage devices, such as, for example, one or more batteries.

[0095] As shown in FIG. 10, the electrical power source 116 may be electrically coupled to one or more of the first bank 46 or the second bank 48 of the hydraulic fracturing units 12 via an additional length of power cable 114, and in some examples, the first bank 46 and the second bank 48 of hydraulic fracturing units 12 may be, electrically coupled to one another via additional lengths of power cable 114. In at least

some such examples, even if one or more of the hydraulic fracturing units 12 lacks electric power, electric power may be supplied to that particular hydraulic fracturing unit 12 via power cables 104 and/or 114, thereby providing an ability to continue operations of the hydraulic fracturing units 12.

[0096] FIG. 11 is a schematic diagram showing a further example system 100 for supplying fuel, enabling communications, and conveying electric power associated with operation of a plurality of hydraulic fracturing units 12 according to embodiments of the disclosure. The example system 100 shown in FIG. 11 may sometimes be referred to as a “hub and spoke” arrangement. In the example shown in FIG. 11, the system 100 includes a fuel source 22 for supplying fuel to the plurality of hydraulic fracturing units 12, and a fuel hub 118 for distributing the fuel from the fuel source 22 to each of the plurality of hydraulic fracturing units 12. For example, the fuel hub 118 may be in flow communication with the fuel source 22 via the main fuel lines 86a and 86b, and the fuel hub 118 may be in flow communication with each of the fuel line connection assemblies 14 of each of the respective hydraulic fracturing units 12 (see, e.g., FIGS. 1, 2A, 2B, and 3). In the example shown, the inlet end 34 of each of the manifold lines 32 of each of the hydraulic fracturing units 12 is connected to an outlet of the main fuel line 86, for example, via the fuel hub 118. In some such examples, the outlet end 36 of each of the manifold lines 32 of the respective hydraulic fracturing units 12 is connected to a blocking device configured to prevent flow from the outlet end 36 of the manifold line 32.

[0097] In the example shown in FIG. 11, the system 100 includes a data center 106 located remotely from each of the hydraulic fracturing units 12 (e.g., the data center 106 is not mechanically connected to the chassis 30 of any of the hydraulic fracturing

units 12). The data center 106 is communicatively connected to a communications hub 120, and each of the hydraulic fracturing units 12 is communicatively connected to the communications hub 120 by their respective communications cable assemblies 102, including the respective communications cables 104.

[0098] In the example shown in FIG.11, the system 100 also includes a power hub 122 electrically connected to each of the hydraulic fracturing units 12 via the respective power cable assemblies 110, including the respective power cables 112. In some examples, the power hub 122 may be configured to supply electric power to any of the hydraulic fracturing units 12 unable to supply its own electric power and/or unable to provide a sufficient amount of its own electric power. For example, at least some of the hydraulic fracturing units 12 may be configured to generate electric power, for example, via one or more genets mounted to the respective chassis 30 of the respective hydraulic fracturing unit 12. Any excess electric power generated by one or more of the hydraulic fracturing units 12 may be electrically communicated to the power hub 122 via the respective power cable assembly 110. Such excess power may be electrically communicated from the power hub 122 to any of the hydraulic fracturing units 12 lacking sufficient electric power via the respective power cable assembly 110.

[0099] FIG. 12 is a schematic diagram showing another example system 100 for supplying fuel, enabling communications, and conveying electric power associated with operation of a plurality of hydraulic fracturing units 12 according to embodiments of the disclosure. The example system 100 shown in FIG. 12 is similar to the example system 100 shown in FIG. 11, except that it includes a first fuel hub 118a and a second fuel hub 118b, a first communications hub 120a and a second communications hub 120b, and a

first power hub 122a and a second power hub 122b, each respectively supplying fuel, communications, and electric power, to the first bank 46 of hydraulic fracturing units 12 and the second bank 48 of the hydraulic fracturing units 12.

[0100] For example, a first main fuel line 86a may provide flow communication from the fuel source 22 to the first fuel hub 118a, and the second main fuel line 86b may provide flow communication from the fuel source 22 to the second fuel hub 118b. The first and second fuel hubs 118a and 118b may respectively supply fuel to each of the manifold lines 32 of the respective hydraulic fracturing units 12 of each of the first and second banks 46 and 48 of the hydraulic fracturing units 12. The first communications hub 120a may be communicatively connected to each of the hydraulic fracturing units 12 of the first bank 46, and the second communications hub 120b may be communicatively connected to each of the hydraulic fracturing units 12 of the second bank 48, for example, via the communications cable assembly 102 of each of the hydraulic fracturing units 12. In some examples, one or more of the first communications hub 120a or the second communications hub 120b may be communicatively connected to the data center 104, for example, as shown in FIG. 12. In some examples, the first and second communications hubs 120a and 120b may be communicatively linked via an intermediate communications cable 124, for example, as shown in FIG. 12.

[0101] As shown in FIG. 12, each of the first and second power hubs 122a and 122b may be electrically connected to the first bank 46 and second bank 48, respectively, of the hydraulic fracturing units 12, for example, via the respective power cable assemblies 110 of each of the hydraulic fracturing units 12. As shown in FIG. 12, in some examples, the first power hub 122a and the second power hub 122b may be electrically

connected to one another via an intermediate power cable 126. In some examples, the first and second power hubs 122a and 122b may be configured to supply electric power to any of the hydraulic fracturing units 12 unable to supply its own electric power and/or unable to provide a sufficient amount of its own electric power. For example, at least some of the hydraulic fracturing units 12 may be configured to generate electric power, for example, via one or more genets mounted to the respective chassis 30 of the respective hydraulic fracturing unit 12. Any excess electric power generated by one or more of the hydraulic fracturing units 12 may be electrically communicated to the first and second power hubs 122a and 122b via the respective power cable assembly 110. Such excess power may be electrically communicated from one or more of the first and second power hubs 122a and/or 122b to any of the hydraulic fracturing units 12 lacking sufficient electric power via the respective power cable assembly 110.

[0102] FIG. 13 is a schematic diagram showing a further example system 100 for supplying fuel, enabling communications, and conveying electric power associated with operation of a plurality of hydraulic fracturing units 12 according to embodiments of the disclosure. The example system shown in FIG. 13 is similar to the example system 100 shown in FIG. 11, except that the system 100 shown in FIG. 13 includes an electrical power source 116 located remote from the hydraulic fracturing units 12 (e.g., not mechanically connected to any of the chassis 30 of the hydraulic fracturing units 12). The electrical power source 116 may be electrically connected to the power hub 122 via an additional length of power cable 114, and the power hub 122 may be electrically connected to each of hydraulic fracturing units 12 via their respective power cable assemblies 110, for example, as shown in FIG. 13.

[0103] FIG. 14 is a schematic diagram showing another example system 100 for supplying fuel, enabling communications, and conveying electric power associated with operation of a plurality of hydraulic fracturing units 12 according to embodiments of the disclosure. The example system 100 shown in FIG. 14 is similar to the example system 100 shown in FIG. 12, except that the system 100 shown in FIG. 14 includes an electrical power source 116 located remote from the hydraulic fracturing units 12 (e.g., not mechanically connected to any of the chassis 30 of the hydraulic fracturing units 12). The electrical power source 116 may be electrically connected to the first power hub power hub 122a via a first additional length of power cable 114a, and connected to the second power hub power hub 122b via a second additional length of power cable 114b. The first and second power hubs 122a and 122b may be electrically connected to each of hydraulic fracturing units 12 via their respective power cable assemblies 110, for example, as shown in FIG. 14.

[0104] FIG. 15 is a schematic diagram showing a further example system 100 for supplying fuel, enabling communications, and conveying electric power associated with operation of a plurality of hydraulic fracturing units 12 according to embodiments of the disclosure. In the example system 100 shown in FIG. 15, the system 100 may include a main fuel manifold 128 in flow communication with the fuel supply 22 via a first main fuel line 86a and a second main fuel line 86b. In some examples, the main fuel manifold 128 may be mounted on a trailer or a truck body for portability (e.g., on a high-pressure iron manifold trailer) or supported by the ground. In the example shown, the main fuel manifold 128 includes a first fuel line 130a and a second fuel line 130b running along the length of the main fuel manifold 128. In some examples, each of the first and second fuel

lines 130a and 130b may include a plurality of valves, each of which may be in flow communication with a respective manifold line 32 of each of the hydraulic fracturing units 12. The first fuel line 130a may be configured to supply fuel to the first bank 46 of hydraulic fracturing units 12, and the second fuel line 130b may be configured to supply fuel to the second bank 48 of the hydraulic fracturing units 12, for example, via the respective manifold lines 32 of the respective hydraulic fracturing units 12. In some examples, the first fuel line 130a and the second fuel line 130b may be in flow communication with one another via an intermediate fuel line 132, which, in some examples, may assist with equalizing pressure and/or volume between the first fuel line 130a and the second fuel line 130b.

[0105] The example system 100 shown in FIG. 15 also includes a communications harness 134 in communication with the data center 106, for example, via a first communications cable 136a and a second communications cable 136b. In some examples, the communications harness 134 may be mounted on a trailer or a truck body for portability (e.g., on a high-pressure iron manifold trailer) or supported by the ground. In some examples, the communications harness 134 may include a plurality of connection points along its length configured to facilitate connection to a communications cable 104 from each of the respective hydraulic fracturing units 12 to provide a communications link between each of the hydraulic fracturing units 12 and the data center 106. As shown, some examples of the communications harness 134 may include a first communications harness 134a and a second communications harness 134b configured to respectively provide communications links with the first bank 46 and the second bank 48 of the hydraulic fracturing units 12.

[0106] As shown in FIG. 15, the example system 100 also includes a power harness 138 in electrical communication with the plurality of power cables 112 of the respective hydraulic fracturing units 12. In some examples, the power harness 138 may be mounted on a trailer or a truck body for portability (e.g., on a high-pressure iron manifold trailer) or supported by the ground. In some examples, the power harness 138 may include a plurality of power receptacles located along its length and configured to facilitate connection with a power plug of a respective power cable 112 from each of the respective hydraulic fracturing units 12 to provide a power link between each of the hydraulic fracturing units 12. In some examples, any excess electric power generated by one or more of the hydraulic fracturing units 12 may be electrically supplied to the power harness 138 via the respective power cable assembly 110. Such excess power may be electrically communicated to any of the hydraulic fracturing units 12 lacking sufficient electric power via the respective power cable assembly 110.

[0107] In the example shown in FIG. 15, the power harness 138 includes a first power harness line 140a and a second power harness line 140b configured to supply electric power to the first bank 46 and the second bank 48 of the hydraulic fracturing units 12, respectively. In some examples, an intermediate power cable 142 may be provided to electrically connect the first power harness line 140a and the second power harness line 140b to one another, for example, so that electric power may be shared between the first power harness line 140a and the second power harness line 140b.

[0108] FIG. 16 is a schematic diagram showing another example system 100 for supplying fuel, enabling communications, and conveying electric power associated with operation of a plurality of hydraulic fracturing units 12 according to embodiments of the

disclosure. The example system 100 is similar to the example system 100 shown in FIG. 15, except that that the example 100 shown in FIG. 16 includes an electrical power source 116 located remote from the hydraulic fracturing units 12 (e.g., not mechanically connected to any of the chassis 30 of the hydraulic fracturing units 12). The electrical power source 116 may be electrically connected to the first and second power harness lines 140a and 140b via first and second additional lengths of power cable 114a and 114b, respectively. The first and second power harness lines 140a and 140b may be electrically connected to each of hydraulic fracturing units 12 via their respective power cable assemblies 110, for example, as shown in FIG. 16.

[0109] FIG. 17A is a perspective view of an example quick connect coupling 144 for coupling two fuel lines 146 to one another shown in an uncoupled condition according to embodiments of the disclosure. FIG. 17B is a perspective view of the example quick connect coupling 144 shown in FIG. 17A shown in a coupled condition according to embodiments of the disclosure. The quick connect coupling 144 may be used with the manifold lines 32 disclosed herein, for example, to couple an inlet end 34 of a first manifold line 32 to an outlet end 36 of a fuel line in flow communication with a fuel source and/or to an outlet end 36 of another manifold line 32 of another hydraulic fracturing unit 12 upstream relative to the first manifold line 32. In addition, the outlet end 36 of the first manifold line 32 may be coupled to an inlet end 34 of yet another manifold line 32 of yet another hydraulic fracturing unit 12 downstream relative to the first manifold line 32 or to a blocking device configured to prevent flow communication from the outlet end of the first manifold line 32. This example configuration may facilitate use of the manifold line

32 to connect manifold lines 32 of multiple hydraulic fracturing units 12 in series or individually to a fuel line from a fuel source.

[0110] As shown in FIG. 17A, an outlet end 36 of a first manifold line 32 may include an outlet coupling 44 of the quick connect coupling 144, and the inlet end 34 of a second manifold line 32 may include an inlet coupling 40 of the quick connect coupling 144. In some examples, this may be reversed. As shown in FIG. 17A, the example outlet coupling 44 may include an annular recess 146 configured to receive an annular projection 148 of the inlet coupling 40. In some examples, the outlet coupling 44 may also include a handle 150 (e.g., an annular handle) configured to facilitate rotation of the outlet coupling 44 relative to the inlet coupling 40, once the annular projection 148 is received in the annular recess 146 of the outlet coupling 44. The annular projection 148 may define a groove or slot 152 configured to receive a pin 154 associated with the annular recess 146. When coupling the outlet coupling 44 to the inlet coupling 40, the annular projection 148 is inserted into the annular recess 146, such that the pin 154 is aligned with a leading edge of the groove or slot 152, so that the annular projection 148 can be inserted into the annular recess 146, while twisting the outlet coupling 44 relative to the inlet coupling 40, so that the pin 154 travels in the groove or slot 152 until the pin 154 is able to engage a notch 156 in the groove or slot 152, thereby locking the rotational relationship between the outlet coupling 44 and the inlet coupling 40, for example, as shown in FIG. 17B, which shows the example couplings 40 and 44 engaged with one another. In some examples, the groove or slot 152 may be configured such that the outlet coupling 44 engages with the inlet coupling 40 upon twisting the outlet coupling 44 about one-quarter turn relative to the inlet coupling 40. Other amounts of relative twist for

coupling are contemplated. In some examples, the quick connect coupling 144 may include one or more fluid seals configured to prevent fuel from leaking from the quick connect coupling 144. In some examples, the quick connect coupling shown in FIGS. 17A and 17B may include a pressure safety lock.

[0111] FIG. 17C is a perspective view of one-half of another example quick connect coupling 144 for coupling two fuel lines to one another shown in an uncoupled condition according to embodiments of the disclosure. The example one-half quick connect coupling 144 shown in FIG. 17C may be configured to threadedly engage another half of the quick connect coupling 144 (e.g., via complimentary male and female threads). In some examples, the quick connect coupling 144 shown in FIG. 17C may include a transfer-loading safety quick coupler.

[0112] In some examples, the quick connect coupling 144 may facilitate quickly coupling two or more manifold lines 32 to one another, and/or quickly coupling a manifold line 32 to a fuel line from a fuel source, to a fuel hub, and/or to a blocking device configured to prevent the flow of fuel from the outlet end of the manifold line 32. This may facilitate connection and/or disconnection of manifold lines 32 during set-up or break-down of the hydraulic fracturing system 16. In some examples, the quick connect coupling 144 may facilitate such set-up and assembly without the use of tools. In some examples, the quick connect couplings 144 may help prevent improperly coupling two inlets to one another or two outlets to one another, which may prevent unintended problems with the fuel delivery system.

[0113] FIG. 18 is a perspective view of an example communications coupling 158 for coupling a communications cable from one device to another device according to embodiments of the disclosure. In some examples, the communications coupling 158 may be configured to couple an end of a length of communications cable 104 of a communications assembly 102 associated with a hydraulic fracturing unit 12 to a communications interface of, for example, another hydraulic fracturing unit 12, a communications interface at a data center 106, and/or a communications interface at a communications hub 120, for example, such as those described herein. The communications coupling 158 may, in some examples, be configured to provide a weather-tight quick connection, for example, such as a mil-spec connector. The communications coupling 158 may include a mating pair (e.g., a plug and a receptacle), including a male (e.g., pin) or female (e.g., socket) contact. In some examples, one or more of the coupling halves (e.g., the male or female halves) and/or the respective contacts may be floating, for example, to minimize mechanical stress at the coupling 158. In some examples, the communication cables 104 may have a capacity ranging from 12 volts to 24 volts and may be shielded to prevent communication from high power energy sources from distorting signals communicated via the communications cables 104.

[0114] In some examples, the communications coupling 158 may facilitate quickly communicatively coupling two or more devices or machines to one another. This may facilitate connection and/or disconnection of communications cables 104 during set-up or break-down of the hydraulic fracturing system 16. In some examples, the communications coupling 158 may facilitate such set-up and assembly without the use of tools. In some examples, the communications couplings 158 may be configured to have

unique communication coupling pairs to prevent coupling the communications cable 104 into an incorrect receptacle, thereby reducing the likelihood of an incorrect rigging and incorrect transfer of data. Other types of communications couplings are contemplated.

[0115] FIG. 19 is a perspective view of an example power coupling 160 configured to couple a power cable 112 to a device according to embodiments of the disclosure. As shown in FIG. 19, the power coupling 160 may include a power plug 162 connected to an end of a power cable 112, and a power receptacle 164. For example, the power cable 112 may be connected to a first hydraulic fracturing unit 12, and the power receptacle 164 may be connected to another hydraulic fracturing unit 12, a power hub 122, and/or an electrical power source 116. The power plug 162 may be configured to be inserted into a power receptacle 164 to provide electric power transfer between a device or machine coupled to the power cable 112 and power plug 162, and the device or machine coupled to the power receptacle 164. In some examples, the power coupling 160 include a shore power connector-type that may be configured to be water-proof, locking, and/or capable of handling three-phase, 480 volts, and/or 400 amps, although power couplings of other types and/or having different capabilities are contemplated.

[0116] In some examples, the power coupling 160 may facilitate quickly electrically coupling two or more devices or machines to one another. This may facilitate connection and/or disconnection of power cables 112 during set-up or break-down of the hydraulic fracturing system 16. In some examples, the power coupling 160 may facilitate such set-up and assembly without the use of tools.

[0117] Having now described some illustrative embodiments of the invention, it should be apparent to those skilled in the art that the foregoing is merely illustrative and not limiting, having been presented by way of example only. Numerous modifications and other embodiments are within the scope of one of ordinary skill in the art and are contemplated as falling within the scope of the invention. In particular, although many of the examples presented herein involve specific combinations of method acts or system elements, it should be understood that those acts and those elements may be combined in other ways to accomplish the same objectives. Those skilled in the art should appreciate that the parameters and configurations described herein are exemplary and that actual parameters and/or configurations will depend on the specific application in which the systems and techniques of the invention are used. Those skilled in the art should also recognize or be able to ascertain, using no more than routine experimentation, equivalents to the specific embodiments of the invention. It is, therefore, to be understood that the embodiments described herein are presented by way of example only and that, within the scope of any appended claims and equivalents thereto, the invention may be practiced other than as specifically described.

[0118] Furthermore, the scope of the present disclosure shall be construed to cover various modifications, combinations, additions, alterations, etc., above and to the above-described embodiments, which shall be considered to be within the scope of this disclosure. Accordingly, various features and characteristics as discussed herein may be selectively interchanged and applied to other illustrated and non-illustrated embodiment, and numerous variations, modifications, and additions further can be made thereto

without departing from the scope of the present invention as set forth in the appended claims.

CLAIMS

What is claimed is:

1. A system for supplying fuel, enabling communications, and conveying electrical power associated with operation of a hydraulic fracturing unit associated with a plurality of hydraulic fracturing units, the system comprising:

a fuel line connection assembly configured to be connected to the hydraulic fracturing unit and to supply fuel from a fuel source to a first gas turbine engine connected to the hydraulic fracturing unit, the fuel line connection assembly comprising:

a manifold line defining an inlet end, an outlet end, and a flow path for fuel extending between the inlet end and the outlet end; and

a distribution line connected to the manifold line and configured to provide flow communication between the manifold line and the first gas turbine engine,

wherein the fuel line connection assembly is configured to one of:

provide flow communication between one of the fuel source or a second gas turbine engine of the plurality of the hydraulic fracturing units upstream of the first gas turbine engine and a third gas turbine engine of the plurality of hydraulic fracturing units downstream of the first gas turbine engine; or

provide flow communication solely between the fuel source and the first gas turbine engine;

a communications cable assembly configured to be connected to the hydraulic fracturing unit and to enable data communications between the hydraulic fracturing unit and one of a data center remote from the hydraulic fracturing unit or a second hydraulic

fracturing unit of the plurality of hydraulic fracturing units, the communications cable assembly comprising:

a length of communications cable; and

a communications cable storage apparatus configured to be connected to the hydraulic fracturing unit, to store the length of communications cable when not in use, and to facilitate deployment of at least a portion of the length of communications cable for connection to the one of the data center or the second hydraulic fracturing unit; and

a power cable assembly configured to be connected to the hydraulic fracturing unit and to convey electrical power between the hydraulic fracturing unit and one or more of a remote electrical power source or one or more of the plurality of hydraulic fracturing units, the power cable assembly comprising:

a length of power cable; and

a power cable storage apparatus configured to be connected to the hydraulic fracturing unit, to store the length of power cable when not in use, and to facilitate deployment of at least a portion of the length of power cable for use.

2. The system of claim 1, wherein the fuel line connection assembly further comprises:

an inlet coupling proximate the inlet end and configured to be connected to a fuel line providing flow communication with the fuel source; and

an outlet coupling proximate the outlet end and configured to be connected to one of an inlet end of another manifold line or a blocking device configured to prevent flow from the outlet end of the manifold line.

3. The system of claim 2, wherein:

the manifold line is a first manifold line;

the inlet coupling of the first manifold line is configured to connect with an outlet coupling of a second manifold line upstream relative to the first manifold line; and

the outlet coupling of the first manifold line is configured to connect with one of an inlet coupling of a third manifold line or a blocking device configured to prevent flow from the outlet end of the first manifold line.

4. The system of claim 2, wherein:

the inlet coupling of the first manifold line comprises one or more of a four-bolt flange or a first quick connect coupling configured to connect the inlet end of the first manifold line in a fluid-tight manner with one or more of a four-bolt flange or a second quick connect coupling of an outlet end of the second manifold line; and

the outlet coupling of the first manifold line comprises one or more of a four-bolt flange or a second quick connect coupling configured to connect the outlet end of the first manifold line in a fluid-tight manner with one of:

one or more of a four-bolt flange or a first quick connect coupling of an inlet end of the third manifold line; or

one or more of a four-bolt flange or a first quick connect coupling of the blocking device.

5. The system of claim 1, wherein the length of communications cable comprises:
a first end configured to be connected to a first unit interface connected to the hydraulic fracturing unit; and

a second end configured to be connected to one of a data center interface of the data center or a second unit interface connected to the second hydraulic fracturing unit.

6. The system of claim 5, wherein one or more of the first end or the second end of the length of communications cable comprises a quick connector configured to be connected to one or more of the first unit interface or the data center interface.

7. The system of claim 1, wherein the communications cable storage apparatus comprises one of a cable reel configured to be connected to the hydraulic fracturing unit or a cable support configured to be connected to the hydraulic fracturing unit and to receive windings of at least a portion of the length of communications cable.

8. The system of claim 1, wherein the remote electrical power source comprises one or more of one or more power generation devices or one or more batteries.

9. The system of claim 1, wherein the length of power cable comprises a first end comprising a power plug and second end comprising a power socket.

10. The system of claim 1, wherein the power cable storage apparatus comprises one of a power cable reel configured to be connected to the hydraulic fracturing unit or a power cable support configured to be connected to the hydraulic fracturing unit and to receive windings of at least a portion of the length of power cable.

11. A hydraulic fracturing unit comprising:

a chassis;

a pump connected to the chassis and configured to pump a fracturing fluid;

a gas turbine engine connected to the chassis and configured to convert fuel into a power output for operating the pump;

a system for supplying fuel, enabling communications, and conveying electrical power associated with operation of the hydraulic fracturing unit, the system comprising:

a fuel line connection assembly connected to the hydraulic fracturing unit and configured to supply fuel from a fuel source to the first gas turbine engine connected to the chassis, the fuel line connection assembly comprising:

a manifold line defining an inlet end, an outlet end, and a flow path for fuel extending between the inlet end and the outlet end; and

a distribution line connected to the manifold line and configured to provide flow communication between the manifold line and the gas turbine engine,

wherein the fuel line connection assembly is configured to one of:

provide flow communication between one of the fuel source or a second gas turbine engine of a second hydraulic fracturing unit upstream of the gas turbine engine and a third gas turbine engine of a hydraulic fracturing unit downstream of the gas turbine engine; or

provide flow communication solely between the fuel source and the gas turbine engine;

a communications cable assembly connected to the hydraulic fracturing unit and configured to enable data communications between the hydraulic fracturing unit and one of a data center remote from the hydraulic fracturing unit or an additional hydraulic fracturing unit, the communications cable assembly comprising:

a length of communications cable; and

a communications cable storage apparatus connected to the hydraulic fracturing unit and configured to store the length of communications cable when not in use and to facilitate deployment of at least a portion of the length of communications cable for connection to the one of the data center or the another hydraulic fracturing unit; and

a power cable assembly connected to the hydraulic fracturing unit and configured to convey electrical power between the hydraulic fracturing unit and one or more of a remote electrical power source or one or more additional hydraulic fracturing units, the power cable assembly comprising:

a length of power cable; and

a power cable storage apparatus connected to the hydraulic fracturing unit and configured to store the length of power cable when not in use and facilitate deployment of at least a portion of the length of power cable for use.

12. The hydraulic fracturing unit of claim 11, wherein the gas turbine engine is connected to the pump via a transmission.

13. A hydraulic fracturing system comprising:

a plurality of hydraulic fracturing units;

a main fuel line configured to supply fuel from a fuel source to a plurality of hydraulic fracturing units;

a first hydraulic fracturing unit of the plurality of hydraulic fracturing units comprising:

a chassis;

a pump connected to the chassis and configured to pump fracturing fluid;

a first gas turbine engine connected to the chassis and configured to convert fuel into a power output for operating the pump;

a system for supplying fuel, enabling communications, and conveying electrical power associated with operation of the first hydraulic fracturing unit, the system comprising:

a fuel line connection assembly connected to the first hydraulic fracturing unit and configured to supply fuel from the fuel source to the first

gas turbine engine, the fuel line connection assembly comprising a manifold line defining an inlet end, an outlet end, and a flow path for fuel extending between the inlet end and the outlet end, the manifold line configured to provide at least a portion of a flow path for supplying fuel to the first gas turbine engine,

wherein the fuel line connection assembly is configured to one of:

provide flow communication between one of the main fuel line or a second gas turbine engine of a second hydraulic fracturing unit upstream of the first gas turbine engine and a third gas turbine engine of a third hydraulic fracturing unit downstream of the first gas turbine engine; or

provide flow communication solely between the main fuel line and the first gas turbine engine;

a communications cable assembly comprising a length of communications cable connected to the first hydraulic fracturing unit and configured to enable data communications between the first hydraulic fracturing unit and one of a data center remote from the first hydraulic fracturing unit or one or more additional hydraulic fracturing units of the plurality of hydraulic fracturing units; and

a power cable assembly comprising a length of power cable connected to the first hydraulic fracturing unit and configured to convey electrical power between the first hydraulic fracturing unit and one or more

of a remote electrical power source or one or more additional hydraulic fracturing units of the plurality of hydraulic fracturing units; and
a data center configured to one or more of transmit communications signals or receive communications signals, the communications signals comprising data indicative of operation of one or more of the plurality of hydraulic fracturing units.

14. The hydraulic fracturing system of claim 13, wherein:

the inlet end of the manifold line of the first hydraulic fracturing unit is connected to an outlet of the main fuel line;

the outlet end of the manifold line of the first hydraulic unit is connected to an inlet end of a manifold line of another one of the plurality of hydraulic fracturing units, thereby providing flow communication through the manifold line of the first hydraulic fracturing unit between the main fuel line and the other one of the plurality of hydraulic fracturing units;

the length of communications cable comprises a proximate end connected to a first unit interface of the first hydraulic fracturing unit and a remote end connected to a second unit interface of another hydraulic fracturing unit of the plurality of hydraulic fracturing units; and

the length of power cable comprises a first power cable end connected to a first receptacle of the first hydraulic fracturing unit and a second power cable end connected to a second receptacle of another hydraulic fracturing unit of the plurality of hydraulic fracturing units.

15. The hydraulic fracturing system of claim 13, further comprising a remote electrical power source, wherein:

the inlet end of the manifold line of the first hydraulic fracturing unit is connected to an outlet of the main fuel line;

the outlet end of the manifold line of the first hydraulic unit is connected to an inlet end of a manifold line of another one of the plurality of hydraulic fracturing units, thereby providing flow communication through the manifold line of the first hydraulic fracturing unit between the main fuel line and the other one of the plurality of hydraulic fracturing units;

the length of communications cable comprises a proximate end connected to a first unit interface of the first hydraulic fracturing unit and a remote end connected to a second unit interface of another hydraulic fracturing unit of the plurality of hydraulic fracturing units; and

the length of power cable comprises a first power cable end connected to a first receptacle of the first hydraulic fracturing unit and a second power cable end connected to the remote electrical power source.

16. The hydraulic fracturing system of claim 15, further comprising a second length of power cable comprising a first power cable end connected to the first hydraulic fracturing unit and a second power cable end coupled to another hydraulic fracturing unit of the plurality of hydraulic fracturing units.

17. The hydraulic fracturing system of claim 13, wherein:

the inlet end of the manifold line of the first hydraulic fracturing unit is connected to an outlet of the main fuel line;

the outlet end of the manifold line of the first hydraulic fracturing unit is connected to a blocking device configured to prevent flow from the outlet end of the manifold line;

the length of communications cable comprises a proximate end connected to a first unit interface of the first hydraulic fracturing unit and a remote end connected to a communications hub interface connected to the data center; and

the length of power cable comprises a first power cable end connected to a first receptacle of the first hydraulic fracturing unit and a second power cable end connected to a power hub connected to a plurality of power cables of a plurality of respective hydraulic fracturing units.

18. The hydraulic fracturing system of claim 17, wherein one or more of:

the fuel hub comprises a first fuel hub, and the hydraulic fracturing system comprises one or more additional fuel hubs;

the communications hub comprises a first hub, and the hydraulic fracturing system comprises one or more additional communications hubs; or

the power hub comprises a first power hub, and the hydraulic fracturing system comprises one or more additional power hubs.

19. The hydraulic fracturing system of claim 13, further comprising a remote electrical power source, wherein:

the inlet end of the manifold line of the first hydraulic fracturing unit is connected to an outlet of the main fuel line;

the outlet end of the manifold line of the first hydraulic unit is connected to a blocking device configured to prevent flow from the outlet end of the manifold line;

the length of communications cable comprises a proximate end connected to a first unit interface of the first hydraulic fracturing unit and a remote end connected to a communications hub interface connected to the data center; and

the length of power cable comprises a first power cable end connected to a first receptacle of the first hydraulic fracturing unit and a second power cable end connected to a power hub connected to a plurality of power cables of a plurality of respective hydraulic fracturing units and the remote electrical power source.

20. The hydraulic fracturing system of claim 19, wherein one or more of:

the fuel hub comprises a first fuel hub, and the hydraulic fracturing system comprises one or more additional fuel hubs;

the communications hub comprises a first hub, and the hydraulic fracturing system comprises one or more additional communications hubs; or

the power hub comprises a first power hub, and the hydraulic fracturing system comprises one or more additional power hubs.

21. The hydraulic fracturing system of claim 13, further comprising one or more of:

a main fuel manifold in flow communication with the fuel supply via the main fuel line;

a communications harness in communication with the data center; or
a power harness in electrical communication with a plurality of power cables of at least some of the plurality of hydraulic fracturing units,
wherein one or more of:
the inlet end of manifold line of the first hydraulic fracturing unit is in flow communication with the main fuel manifold;
the communications cable is connected to the communications harness;
or
the power cable of the first hydraulic unit is connected to the power harness.

22. The hydraulic fracturing system of claim 13, further comprising a remote electrical power source and one or more of:

a main fuel manifold in flow communication with the fuel supply via the main fuel line;
a communications harness in communication with the data center; or
a power harness in electrical communication with the remote electrical power source and a plurality of power cables of at least some of the plurality of hydraulic fracturing units,
wherein one or more of:
the inlet end of manifold line of the first hydraulic fracturing unit is in flow communication with the main fuel manifold;

the communications cable is connected to the communications harness;
or
the power cable of the first hydraulic unit is connected to the power harness.

23. A system for supplying fuel, enabling communications, and conveying electrical power associated with operation of a hydraulic fracturing unit associated with a plurality of hydraulic fracturing units, the system comprising:

a fuel line connection assembly configured to be connected to the hydraulic fracturing unit and to supply fuel from a fuel source to a first gas turbine engine connected to the hydraulic fracturing unit, the fuel line connection assembly comprising:

a manifold line defining an inlet end, an outlet end, and a flow path for fuel extending between the inlet end and the outlet end; and

a distribution line connected to the manifold line and configured to provide flow communication between the manifold line and the first gas turbine engine, wherein the fuel line connection assembly is configured to one of:

provide flow communication between one of the fuel source or a second gas turbine engine of the plurality of the hydraulic fracturing units upstream of the first gas turbine engine and a third gas turbine engine of the plurality of hydraulic fracturing units downstream of the first gas turbine engine; or

provide flow communication solely between the fuel source and the first gas turbine engine;

a communications cable assembly configured to be connected to the hydraulic fracturing unit and to enable data communications between the hydraulic fracturing unit

and one of a data center remote from the hydraulic fracturing unit or a second hydraulic fracturing unit of the plurality of hydraulic fracturing units, the communications cable assembly comprising:

- a length of communications cable; and

- a communications cable storage apparatus configured to be connected to the hydraulic fracturing unit, to store the length of communications cable when not in use, and to facilitate deployment of at least a portion of the length of communications cable for connection to the one of the data center or the second hydraulic fracturing unit; and

- a power cable assembly configured to be connected to the hydraulic fracturing unit and to convey electrical power between the hydraulic fracturing unit and one or more of a remote electrical power source or one or more of the plurality of hydraulic fracturing units, the power cable assembly comprising:

- a length of power cable; and

- a power cable storage apparatus, configured to be connected to the hydraulic fracturing unit, to store the length of power cable and facilitate deployment of at least a portion of the length of power cable for use.

24. The system of claim 23, wherein the fuel line connection assembly further comprises:

- an inlet coupling proximate the inlet end and configured to be connected to a fuel line providing flow communication with the fuel source; and

an outlet coupling proximate the outlet end and configured to be connected to one of an inlet end of another manifold line or a blocking device configured to prevent flow from the outlet end of the manifold line.

25. The system of claim 24, wherein:

the manifold line is a first manifold line;

the inlet coupling of the first manifold line is configured to connect with an outlet coupling of a second manifold line upstream relative to the first manifold line; and

the outlet coupling of the first manifold line is configured to connect with one of an inlet coupling of a third manifold line or a blocking device configured to prevent flow from the outlet end of the first manifold line.

26. The system of claim 24, wherein:

the inlet coupling of the first manifold line comprises one or more of: (a) a four-bolt flange coupling or (b) a first quick connect coupling, each configured to connect the inlet end of the first manifold line in a fluid-tight manner with one or more of a corresponding (c) a four-bolt flange coupling or (d) a second quick connect coupling, each associated with an outlet end of the second manifold line; and

the outlet coupling of the first manifold line comprises one or more of a four-bolt flange coupling or a second quick connect coupling configured to connect the outlet end of the first manifold line in a fluid-tight manner with one of:

one or more of a four-bolt flange coupling or a first quick connect coupling of an inlet end of the third manifold line; or

one or more of a four-bolt flange coupling or a first quick connect coupling of the blocking device.

27. The system of claim 23, wherein the length of communications cable comprises:
a first end configured to be connected to a first unit interface connected to the hydraulic fracturing unit; and

a second end configured to be connected to one of a data center interface of the data center or a second unit interface connected to the second hydraulic fracturing unit.

28. The system of claim 27, wherein one or more of the first end or the second end of the length of communications cable comprises a quick connector configured to be connected to one or more of the first unit interface or the data center interface.

29. The system of claim 23, wherein the communications cable storage apparatus comprises one of a cable reel configured to be connected to the hydraulic fracturing unit or a cable support configured to be connected to the hydraulic fracturing unit and to receive windings of at least a portion of the length of communications cable.

30. The system of claim 23, wherein the remote electrical power source comprises one or more of one or more power generation devices or one or more batteries.

31. The system of claim 23, wherein the length of power cable comprises a first end comprising a power plug and second end comprising a power socket.

32. The system of claim 23, wherein the power cable storage apparatus comprises one of a power cable reel configured to be connected to the hydraulic fracturing unit or a power cable support configured to be connected to the hydraulic fracturing unit and to receive windings of at least a portion of the length of power cable.

33. A hydraulic fracturing unit comprising:

- a chassis;

- a pump connected to the chassis and configured to pump a fracturing fluid;

- a gas turbine engine connected to the chassis and configured to convert fuel into a power output for operating the pump;

- a system for supplying fuel, enabling communications, and conveying electrical power associated with operation of the hydraulic fracturing unit, the system comprising:

- a fuel line connection assembly connected to the hydraulic fracturing unit and configured to supply fuel from a fuel source to the first gas turbine engine connected to the chassis, the fuel line connection assembly comprising:

- a manifold line defining an inlet end, an outlet end, and a flow path for fuel extending between the inlet end and the outlet end; and

- a distribution line connected to the manifold line and configured to provide flow communication between the manifold line and the gas turbine engine,

- wherein the fuel line connection assembly is configured to one of:

provide flow communication between one of the fuel source or a second gas turbine engine of a second hydraulic fracturing unit upstream of the gas turbine engine and a third gas turbine engine of a hydraulic fracturing unit downstream of the gas turbine engine; or

provide flow communication solely between the fuel source and the gas turbine engine;

a communications cable assembly connected to the hydraulic fracturing unit and configured to enable data communications between the hydraulic fracturing unit and one of a data center remote from the hydraulic fracturing unit or an additional hydraulic fracturing unit, the communications cable assembly comprising:

a length of communications cable; and

a communications cable storage apparatus connected to the hydraulic fracturing unit and configured to store the length of communications cable when not in use and to facilitate deployment of at least a portion of the length of communications cable for connection to the one of the data center or the another hydraulic fracturing unit; and

a power cable assembly connected to the hydraulic fracturing unit and configured to convey electrical power between the hydraulic fracturing unit and one or more of a remote electrical power source or one or more additional hydraulic fracturing units, the power cable assembly comprising:

a length of power cable; and

a power cable storage apparatus connected to the hydraulic fracturing unit and configured to store the length of power cable when not in use and facilitate deployment of at least a portion of the length of power cable for use.

34. The hydraulic fracturing unit of claim 33, wherein the gas turbine engine is connected to the pump via a transmission.

35. A hydraulic fracturing system comprising:

a plurality of hydraulic fracturing units;

a main fuel line configured to supply fuel from a fuel source to a plurality of hydraulic fracturing units;

a first hydraulic fracturing unit of the plurality of hydraulic fracturing units comprising:

a chassis;

a pump connected to the chassis and configured to pump fracturing fluid;

a first gas turbine engine connected to the chassis and configured to convert fuel into a power output for operating the pump;

a system for supplying fuel, enabling communications, and conveying electrical power associated with operation of the first hydraulic fracturing unit, the system comprising:

a fuel line connection assembly connected to the first hydraulic fracturing unit and configured to supply fuel from the fuel source to the first gas turbine

engine, the fuel line connection assembly comprising a manifold line defining an inlet end, an outlet end, and a flow path for fuel extending between the inlet end and the outlet end, the manifold line configured to provide at least a portion of a flow path for supplying fuel to the first gas turbine engine,

wherein the fuel line connection assembly is configured to one of:

provide flow communication between one of the main fuel line or a second gas turbine engine of a second hydraulic fracturing unit upstream of the first gas turbine engine and a third gas turbine engine of a third hydraulic fracturing unit downstream of the first gas turbine engine; or

provide flow communication solely between the main fuel line and the first gas turbine engine;

a communications cable assembly including a length of communications cable connected to the first hydraulic fracturing unit and configured to enable data communications between the first hydraulic fracturing unit and one of a data center remote from the first hydraulic fracturing unit or one or more additional hydraulic fracturing units of the plurality of hydraulic fracturing units; and

a power cable assembly including a length of power cable connected to the first hydraulic fracturing unit and configured to convey electrical power between the first hydraulic fracturing unit and one or more of a remote electrical power source or one or more additional hydraulic fracturing units of the plurality of hydraulic fracturing units; and

a data center configured to one or more of transmit communications signals or receive communications signals, the communications signals comprising data indicative of operation of one or more of the plurality of hydraulic fracturing units.

36. The hydraulic fracturing system of claim 35, wherein:

the inlet end of the manifold line of the first hydraulic fracturing unit is connected to an outlet of the main fuel line;

the outlet end of the manifold line of the first hydraulic fracturing unit is connected to an inlet end of a manifold line of another one of the plurality of hydraulic fracturing units, thereby providing flow communication through the manifold line of the first hydraulic fracturing unit between the main fuel line and the other one of the plurality of hydraulic fracturing units;

the length of communications cable comprises a proximate end connected to a first unit interface of the first hydraulic fracturing unit and a remote end connected to a second unit interface of another hydraulic fracturing unit of the plurality of hydraulic fracturing units; and

the length of power cable comprises a first power cable end connected to a first receptacle of the first hydraulic fracturing unit and a second power cable end connected to a second receptacle of another hydraulic fracturing unit of the plurality of hydraulic fracturing units.

37. The hydraulic fracturing system of claim 35, further comprising a remote electrical power source, wherein:

the inlet end of the manifold line of the first hydraulic fracturing unit is connected to an outlet of the main fuel line;

the outlet end of the manifold line of the first hydraulic fracturing unit is connected to an inlet end of a manifold line of another one of the plurality of hydraulic fracturing units, thereby providing flow communication through the manifold line of the first hydraulic fracturing unit between the main fuel line and the other one of the plurality of hydraulic fracturing units;

the length of communications cable comprises a proximate end connected to a first unit interface of the first hydraulic fracturing unit and a remote end connected to a second unit interface of another hydraulic fracturing unit of the plurality of hydraulic fracturing units; and

the length of power cable comprises a first power cable end connected to a first receptacle of the first hydraulic fracturing unit and a second power cable end connected to the remote electrical power source.

38. The hydraulic fracturing system of claim 37, further comprising a second length of power cable comprising a first power cable end connected to the first hydraulic fracturing unit and a second power cable end coupled to another hydraulic fracturing unit of the plurality of hydraulic fracturing units.

39. The hydraulic fracturing system of claim 35, wherein:

the inlet end of the manifold line of the first hydraulic fracturing unit is connected to a fuel hub;

the outlet end of the manifold line of the first hydraulic fracturing unit is connected to a blocking device configured to prevent flow from the outlet end of the manifold line;

the length of communications cable comprises a proximate end connected to a first unit interface of the first hydraulic fracturing unit and a remote end connected to a communications hub interface connected to the data center; and

the length of power cable comprises a first power cable end connected to a first receptacle of the first hydraulic fracturing unit and a second power cable end connected to a power hub connected to a plurality of power cables of a plurality of respective hydraulic fracturing units.

40. The hydraulic fracturing system of claim 39, wherein one or more of:

the fuel hub comprises a first fuel hub, and the hydraulic fracturing system comprises one or more additional fuel hubs;

the communications hub interface comprises a first communications hub interface, and the hydraulic fracturing system comprises one or more additional communications hub interfaces; or

the power hub comprises a first power hub, and the hydraulic fracturing system comprises one or more additional power hubs.

41. The hydraulic fracturing system of claim 35, further comprising a remote electrical power source, wherein:

the inlet end of the manifold line of the first hydraulic fracturing unit is connected to a fuel hub;

the outlet end of the manifold line of the first hydraulic fracturing unit is connected to a blocking device configured to prevent flow from the outlet end of the manifold line;

the length of communications cable comprises a proximate end connected to a first unit interface of the first hydraulic fracturing unit and a remote end connected to a communications hub interface connected to the data center; and

the length of power cable comprises a first power cable end connected to a first receptacle of the first hydraulic fracturing unit and a second power cable end connected to a power hub connected to a plurality of power cables of a plurality of respective hydraulic fracturing units and the remote electrical power source.

42. The hydraulic fracturing system of claim 41, wherein one or more of:

the fuel hub comprises a first fuel hub, and the hydraulic fracturing system comprises one or more additional fuel hubs;

the communications hub interface comprises a first communications hub interface, and the hydraulic fracturing system comprises one or more additional communications hub interfaces; or

the power hub comprises a first power hub, and the hydraulic fracturing system comprises one or more additional power hubs.

43. The hydraulic fracturing system of claim 35, further comprising one or more of:

a main fuel manifold in flow communication with the fuel supply via the main fuel line;

a communications harness in communication with the data center; or

a power harness in electrical communication with a plurality of power cables of at least some of the plurality of hydraulic fracturing units,

wherein one or more of:

the inlet end of the manifold line of the first hydraulic fracturing unit is in flow communication with the main fuel manifold;

the communications cable is connected to the communications harness; or

the power cable of the first hydraulic fracturing unit is connected to the power harness.

44. The hydraulic fracturing system of claim 35, further comprising a remote electrical power source and one or more of:

a main fuel manifold in flow communication with the fuel supply via the main fuel line;

a communications harness in communication with the data center; or

a power harness in electrical communication with the remote electrical power source and a plurality of power cables of at least some of the plurality of hydraulic fracturing units,

wherein one or more of:

the inlet end of the manifold line of the first hydraulic fracturing unit is in flow communication with the main fuel manifold;

the communications cable is connected to the communications harness; or

the power cable of the first hydraulic fracturing unit is connected to the power harness.

45. A system for supplying fuel, enabling communications, and conveying electrical power associated with operation of a hydraulic fracturing unit associated with a plurality of hydraulic fracturing units, the system comprising:

a fuel line connection assembly configured to be connected to the hydraulic fracturing unit and to supply fuel from a fuel source to a first gas turbine engine connected to the hydraulic fracturing unit, the fuel line connection assembly comprising:

a manifold line defining an inlet end, an outlet end, and a flow path for fuel extending between the inlet end and the outlet end; and

a distribution line connected to the manifold line and configured to provide flow communication between the manifold line and the first gas turbine engine, wherein the fuel line connection assembly is configured to:

provide flow communication between one of the fuel source or a second gas turbine engine of the plurality of the hydraulic fracturing units upstream of the first gas turbine engine and a third gas turbine engine of the plurality of hydraulic fracturing units downstream of the first gas turbine engine;

a communications cable assembly configured to be connected to the hydraulic fracturing unit and to enable data communications between the hydraulic fracturing unit and one of a data center remote from the hydraulic fracturing unit or a second hydraulic fracturing unit of the plurality of hydraulic fracturing units; and

a power cable assembly configured to be connected to the hydraulic fracturing unit and to convey electrical power between the hydraulic fracturing unit and one or more of

a remote electrical power source or one or more of the plurality of hydraulic fracturing units.

46. The system of claim 45, wherein the fuel line connection assembly further comprises:

an inlet coupling proximate the inlet end and configured to be connected to a fuel line providing flow communication with the fuel source; and

an outlet coupling proximate the outlet end and configured to be connected to one of an inlet end of another manifold line or a blocking device configured to prevent flow from the outlet end of the manifold line.

47. The system of claim 46, wherein:

the manifold line is a first manifold line;

the inlet coupling of the first manifold line is configured to connect with an outlet coupling of a second manifold line upstream relative to the first manifold line; and

the outlet coupling of the first manifold line is configured to connect with one of an inlet coupling of a third manifold line or a blocking device configured to prevent flow from the outlet end of the first manifold line.

48. The system of claim 46, wherein:

the inlet coupling of the first manifold line comprises one or more of a four-bolt flange or a first quick connect coupling configured to connect the inlet end of the first

manifold line in a fluid-tight manner with one or more of a four-bolt flange or a second quick connect coupling of an outlet end of the second manifold line; and

the outlet coupling of the first manifold line comprises one or more of a four-bolt flange or a second quick connect coupling configured to connect the outlet end of the first manifold line in a fluid-tight manner with one of:

one or more of a four-bolt flange or a first quick connect coupling of an inlet end of the third manifold line; or

one or more of a four-bolt flange or a first quick connect coupling of the blocking device.

49. The system of claim 45, wherein the length of communications cable assembly comprises a length of communications cable including:

a first end configured to be connected to a first unit interface connected to the hydraulic fracturing unit; and

a second end configured to be connected to one of a data center interface of the data center or a second unit interface connected to the second hydraulic fracturing unit.

50. The system of claim 49, wherein one or more of the first end or the second end of the length of communications cable comprises a quick connector configured to be connected to one or more of the first unit interface or the data center interface.

51. The system of claim 45, wherein the communications cable assembly comprises:
a length of communications cable; and

a communications cable storage apparatus configured to be connected to the hydraulic fracturing unit, to store the length of communications cable when not in use, and to facilitate deployment of at least a portion of the length of communications cable for connection to the one of the data center or the second hydraulic fracturing unit, and

wherein the communications cable storage apparatus comprises one of a cable reel configured to be connected to the hydraulic fracturing unit or a cable support configured to be connected to the hydraulic fracturing unit and to receive windings of at least a portion of the length of communications cable.

52. The system of claim 45, wherein the remote electrical power source comprises one or more of one or more power generation devices or one or more batteries.

53. The system of claim 45, wherein the power cable assembly comprises a length of power cable including a first end having a power plug and second end having a power socket.

54. The system of claim 45, wherein the power cable assembly comprises:

a length of power cable; and

a power cable storage apparatus configured to be connected to the hydraulic fracturing unit, to store the length of power cable when not in use, and to facilitate deployment of at least a portion of the length of power cable for use, and

wherein the power cable storage apparatus comprises one of a power cable reel configured to be connected to the hydraulic fracturing unit or a power cable support

configured to be connected to the hydraulic fracturing unit and to receive windings of at least a portion of the length of power cable.

55. A hydraulic fracturing unit comprising:

- a chassis;

- a pump connected to the chassis and configured to pump a fracturing fluid;

- a gas turbine engine connected to the chassis and configured to convert fuel into a power output for operating the pump;

- a system for supplying fuel, enabling communications, and conveying electrical power associated with operation of the hydraulic fracturing unit, the system comprising:

- a fuel line connection assembly connected to the hydraulic fracturing unit and configured to supply fuel from a fuel source to the first gas turbine engine connected to the chassis, the fuel line connection assembly comprising:

- a manifold line defining an inlet end, an outlet end, and a flow path for fuel extending between the inlet end and the outlet end; and

- a distribution line connected to the manifold line and configured to provide flow communication between the manifold line and the gas turbine engine,

- wherein the fuel line connection assembly is configured to:

- provide flow communication between one of the fuel source or a second gas turbine engine of a second hydraulic fracturing unit upstream of the gas turbine engine and a third gas turbine engine of a hydraulic fracturing unit downstream of the gas turbine engine;

a communications cable assembly connected to the hydraulic fracturing unit and configured to enable data communications between the hydraulic fracturing unit and one of a data center remote from the hydraulic fracturing unit or an additional hydraulic fracturing unit; and

a power cable assembly connected to the hydraulic fracturing unit and configured to convey electrical power between the hydraulic fracturing unit and one or more of a remote electrical power source or one or more additional hydraulic fracturing units.

56. The hydraulic fracturing unit of claim 55, wherein the gas turbine engine is connected to the pump via a transmission.

57. A hydraulic fracturing system comprising:

a plurality of hydraulic fracturing units;

a main fuel line configured to supply fuel from a fuel source to a plurality of hydraulic fracturing units; and

a first hydraulic fracturing unit of the plurality of hydraulic fracturing units comprising:

a chassis;

a pump connected to the chassis and configured to pump fracturing fluid;

a first gas turbine engine connected to the chassis and configured to convert fuel into a power output for operating the pump;

a system for supplying fuel, enabling communications, and conveying electrical power associated with operation of the first hydraulic fracturing unit, the system comprising:

a fuel line connection assembly connected to the first hydraulic fracturing unit and configured to:

provide flow communication between one of the main fuel line or a second gas turbine engine of a second hydraulic fracturing unit upstream of the first gas turbine engine and a third gas turbine engine of a third hydraulic fracturing unit downstream of the first gas turbine engine;

a communications cable assembly configured to enable data communications between the first hydraulic fracturing unit and one of a data center remote from the first hydraulic fracturing unit or one or more additional hydraulic fracturing units of the plurality of hydraulic fracturing units; and

a power cable assembly configured to convey electrical power between the first hydraulic fracturing unit and one or more of a remote electrical power source or one or more additional hydraulic fracturing units of the plurality of hydraulic fracturing units.

58. The hydraulic fracturing system of claim 57, wherein:

the fuel line connection assembly comprises a manifold line defining an inlet end, an outlet end, and a flow path for fuel extending between the inlet end and the outlet end,

the manifold line being configured to provide at least a portion of a flow path for supplying fuel to the first gas turbine engine;

the inlet end of the manifold line of the first hydraulic fracturing unit is connected to an outlet of the main fuel line;

the outlet end of the manifold line of the first hydraulic unit is connected to an inlet end of a manifold line of another one of the plurality of hydraulic fracturing units, thereby providing flow communication through the manifold line of the first hydraulic fracturing unit between the main fuel line and the other one of the plurality of hydraulic fracturing units;

the communications assembly comprises a length of communications cable having a proximate end connected to a first unit interface of the first hydraulic fracturing unit and a remote end connected to a second unit interface of another hydraulic fracturing unit of the plurality of hydraulic fracturing units; and

the power cable assembly comprises a length of power cable having a first power cable end connected to a first receptacle of the first hydraulic fracturing unit and a second power cable end connected to a second receptacle of another hydraulic fracturing unit of the plurality of hydraulic fracturing units.

59. The hydraulic fracturing system of claim 58, further comprising a remote electrical power source, wherein:

the inlet end of the manifold line of the first hydraulic fracturing unit is connected to an outlet of the main fuel line;

the outlet end of the manifold line of the first hydraulic unit is connected to an inlet end of a manifold line of another one of the plurality of hydraulic fracturing units, thereby

providing flow communication through the manifold line of the first hydraulic fracturing unit between the main fuel line and the other one of the plurality of hydraulic fracturing units;

the length of communications cable comprises a proximate end connected to a first unit interface of the first hydraulic fracturing unit and a remote end connected to a second unit interface of another hydraulic fracturing unit of the plurality of hydraulic fracturing units; and

the length of power cable comprises a first power cable end connected to a first receptacle of the first hydraulic fracturing unit and a second power cable end connected to the remote electrical power source.

60. The hydraulic fracturing system of claim 59, further comprising a second length of power cable comprising a first power cable end connected to the first hydraulic fracturing unit and a second power cable end coupled to another hydraulic fracturing unit of the plurality of hydraulic fracturing units.

61. The hydraulic fracturing system of claim 58, wherein:

the inlet end of the manifold line of the first hydraulic fracturing unit is connected to a fuel hub;

the outlet end of the manifold line of the first hydraulic fracturing unit is connected to a blocking device configured to prevent flow from the outlet end of the manifold line;

the length of communications cable comprises a proximate end connected to a first unit interface of the first hydraulic fracturing unit and a remote end connected to a communications hub interface connected to the data center; and

the length of power cable comprises a first power cable end connected to a first receptacle of the first hydraulic fracturing unit and a second power cable end connected to a power hub connected to a plurality of power cables of a plurality of respective hydraulic fracturing units.

62. The hydraulic fracturing system of claim 61, wherein one or more of:

the fuel hub comprises a first fuel hub, and the hydraulic fracturing system comprises one or more additional fuel hubs;

the communications hub interface comprises a first communications hub interface, and the hydraulic fracturing system comprises one or more additional communications hub interfaces; or

the power hub comprises a first power hub, and the hydraulic fracturing system comprises one or more additional power hubs.

63. The hydraulic fracturing system of claim 58, further comprising a remote electrical power source, wherein:

the inlet end of the manifold line of the first hydraulic fracturing unit is connected to a fuel hub;

the outlet end of the manifold line of the first hydraulic unit is connected to a blocking device configured to prevent flow from the outlet end of the manifold line;

the length of communications cable comprises a proximate end connected to a first unit interface of the first hydraulic fracturing unit and a remote end connected to a communications hub interface connected to the data center; and

the length of power cable comprises a first power cable end connected to a first receptacle of the first hydraulic fracturing unit and a second power cable end connected to a power hub connected to a plurality of power cables of a plurality of respective hydraulic fracturing units and the remote electrical power source.

64. The hydraulic fracturing system of claim 63, wherein one or more of:

the fuel hub comprises a first fuel hub, and the hydraulic fracturing system comprises one or more additional fuel hubs;

the communications hub interface comprises a first communications hub interface, and the hydraulic fracturing system comprises one or more additional communications hub interfaces; or

the power hub comprises a first power hub, and the hydraulic fracturing system comprises one or more additional power hubs.

65. The hydraulic fracturing system of claim 58, further comprising one or more of:

a main fuel manifold in flow communication with the fuel supply via the main fuel line;

a communications harness in communication with the data center; or

a power harness in electrical communication with a plurality of power cables of at least some of the plurality of hydraulic fracturing units,

wherein one or more of:

the inlet end of manifold line of the first hydraulic fracturing unit is in flow communication with the main fuel manifold;

the communications cable is connected to the communications harness; or
the power cable of the first hydraulic fracturing unit is connected to the
power harness.

66. The hydraulic fracturing system of claim 58 further comprising a remote electrical
power source and one or more of:

a main fuel manifold in flow communication with the fuel supply via the main fuel
line;

a communications harness in communication with the data center; or

a power harness in electrical communication with the remote electrical power
source and a plurality of power cables of at least some of the plurality of hydraulic
fracturing units,

wherein one or more of:

the inlet end of manifold line of the first hydraulic fracturing unit is in flow
communication with the main fuel manifold;

the communications cable is connected to the communications harness; or

the power cable of the first hydraulic unit is connected to the power harness.

67. The system of claim 45, wherein the distribution line is connected to the manifold
line and the first gas turbine engine and is configured to provide flow communication
solely between the manifold line and the first gas turbine engine.

68. The hydraulic fracturing unit of claim 55, wherein the distribution line is connected to the manifold line and the gas turbine engine and is configured to provide flow communication solely between the manifold line and the gas turbine engine.

69. The hydraulic fracturing system of claim 57, wherein fuel line connection assembly includes a manifold line and a distribution line, and the distribution line is connected to the manifold line and the first gas turbine engine and is configured to provide flow communication solely between the manifold line and the first gas turbine engine.

70. A system comprising:

a fuel line connection assembly to supply fuel from a fuel source to a first gas turbine engine when connected to one of a plurality of hydraulic fracturing units and to provide fluid flow communication between (a) one of (1) a fuel source or (2) a second gas turbine engine of a second of the plurality of the hydraulic fracturing units when positioned upstream of the first gas turbine engine and (b) a third gas turbine engine of a third of the plurality of hydraulic fracturing units when positioned downstream of the first gas turbine engine, the fuel line connection assembly comprising:

a manifold line having an inlet end, an outlet end, and a flow path for fuel extending between the inlet end and the outlet end, and

a distribution line connected to the manifold line and configured to provide flow communication between the manifold line and the first gas turbine engine when connected thereto;

a communications cable assembly to enable data communications between (c) the one of the plurality of hydraulic fracturing units and (d) one of (1) a data center remote from the one of the plurality of hydraulic fracturing units or (2) a second of the plurality of hydraulic fracturing units; and

a power cable assembly to convey electrical power between (e) the one of the plurality of hydraulic fracturing units when connected thereto and (f) one or more of (1) a remote electrical power source, or (2) another one of the plurality of hydraulic fracturing units when connected thereto.

71. The system of claim 70, wherein the fuel line connection assembly further comprises:

an inlet coupling proximate the inlet end and configured to be connected to a fuel line providing flow communication with the fuel source; and

an outlet coupling proximate the outlet end and configured to be connected to one of (a) an inlet end of another manifold line or (b) a blocking device configured to prevent flow from the outlet end of the manifold line.

72. The system of claim 71, wherein:

the manifold line comprises a first manifold line;

the inlet coupling of the first manifold line configured to connect with an outlet coupling of a second manifold line upstream relative to the first manifold line; and

the outlet coupling of the first manifold line is configured to connect with one of (a) an inlet coupling of a third manifold line or (b) a blocking device configured to prevent flow from the outlet end of the first manifold line.

73. The system of claim 71, wherein:

the inlet coupling of the first manifold line comprises one or more of (a) a four-bolt flange or (b) a first quick connect coupling configured to connect the inlet end of the first manifold line in a fluid-tight manner with one or more of (c) a four-bolt flange or (d) a second quick connect coupling of an outlet end of the second manifold line; and

the outlet coupling of the first manifold line comprises one or more of (e) a four-bolt flange or (f) a second quick connect coupling configured to connect the outlet end of the first manifold line in a fluid-tight manner with one of:

(g) one or more of (1) a four-bolt flange or (2) a first quick connect coupling of an inlet end of the third manifold line; or

(h) one or more of (1) a four-bolt flange or (2) a first quick connect coupling of the blocking device.

74. The system of claim 70, wherein the communications cable assembly comprises a length of communications cable including:

a first end configured to be connected to a first unit interface connected to the one of the plurality of hydraulic fracturing units; and

a second end configured to be connected to one of (a) a data center interface of the data center or (b) a second unit interface connected to the second of the plurality of hydraulic fracturing units.

75. The system of claim 74, wherein one or more of (a) the first end or (b) the second end of the length of communications cable comprises a quick connector configured to be connected to one or more of (c) the first unit interface or (d) the data center interface.

76. The system of claim 70, wherein the communications cable assembly comprises:
a selected length of communications cable; and

a communications cable storage apparatus configured to be connected to the one of the plurality of hydraulic fracturing units, to store at least a portion of the selected length of the communications cable when not in use, and to facilitate deployment of the at least a portion of the length of communications cable for connection to the one of (a) the data center or (b) the second of the plurality of hydraulic fracturing units, and

wherein the communications cable storage apparatus comprises one of (c) a cable reel configured to be connected to the one of the plurality of hydraulic fracturing units or (d) a cable support configured to be connected to the one of the plurality of hydraulic fracturing units and to receive windings of at least a portion of the length of communications cable.

77. The system of claim 70, wherein the remote electrical power source comprises one or more of (a) one or more power generation devices or (b) one or more batteries.

78. The system of claim 70, wherein the power cable assembly comprises:

a selected length of power cable including a first end having a power plug and second end having a power socket; and

a power cable storage apparatus configured to be connected to the one of the hydraulic fracturing units, to store at least a portion of the selected length of power cable when not in use, and to facilitate deployment of the at least a portion of the selected length of power cable for use, the power cable storage apparatus comprising one of (a) a power cable reel configured to be connected to the one of the plurality of hydraulic fracturing units or (b) a power cable support configured to be connected to the hydraulic fracturing unit and to receive windings of the at least a portion of the selected length of power cable.

79. A hydraulic fracturing unit comprising:

a chassis;

a pump connected to the chassis and configured to pump a fracturing fluid;

a gas turbine engine connected to the chassis and configured to convert fuel into a power output for operating the pump;

a system for supplying fuel, enabling communications, and conveying electrical power associated with operation of the hydraulic fracturing unit, the system comprising:

a fuel line connection assembly connected to the hydraulic fracturing unit and configured to supply fuel from a fuel source to the first gas turbine engine connected to the chassis and to provide flow communication between (a) one of (1) the fuel source or (2) a second gas turbine engine of a second hydraulic

fracturing unit upstream of the gas turbine engine and (b) a third gas turbine engine of a hydraulic fracturing unit downstream of the gas turbine engine, the fuel line connection assembly comprising:

a manifold line defining an inlet end, an outlet end, and a flow path for fuel extending between the inlet end and the outlet end, and

a distribution line connected to the manifold line and configured to provide flow communication between the manifold line and the gas turbine engine;

a communications cable assembly connected to the hydraulic fracturing unit and configured to enable data communications between the hydraulic fracturing unit and one of (c) a data center remote from the hydraulic fracturing unit or (d) another hydraulic fracturing unit; and

a power cable assembly connected to the hydraulic fracturing unit and configured to convey electrical power between the hydraulic fracturing unit and one or more of a remote electrical power source or one or more additional hydraulic fracturing units.

80. The hydraulic fracturing unit of claim 79, wherein the gas turbine engine is connected to the pump via a transmission.

81. A hydraulic fracturing system comprising:

a plurality of hydraulic fracturing units;

a main fuel line positioned to supply fuel from a fuel source to a plurality of hydraulic fracturing units; and

a first hydraulic fracturing unit of the plurality of hydraulic fracturing units comprising:

- a chassis;

- a pump connected to the chassis to pump fracturing fluid;

- a first gas turbine engine connected to the chassis and to convert fuel into a power output for operating the pump;

- a system to supply fuel, enable communications, and convey electrical power associated with operation of the first hydraulic fracturing unit, the system comprising:

 - a fuel line connection assembly connected to the first hydraulic fracturing unit to provide flow communication between one of the main fuel line or a second gas turbine engine of a second hydraulic fracturing unit of the plurality of hydraulic fracturing units positioned upstream of the first gas turbine engine and a third gas turbine engine of a third hydraulic fracturing unit of the plurality of hydraulic fracturing units positioned downstream of the first gas turbine engine;

 - a communications cable assembly to enable data communications between the first hydraulic fracturing unit and one of a data center remote from the first hydraulic fracturing unit or one or more additional hydraulic fracturing units of the plurality of hydraulic fracturing units; and

 - a power cable assembly to convey electrical power between the first hydraulic fracturing unit and one or more of a remote electrical power source

or one or more additional hydraulic fracturing units of the plurality of hydraulic fracturing units.

82. The hydraulic fracturing system of claim 81, wherein:

the fuel line connection assembly comprises a manifold line defining an inlet end, an outlet end, and a flow path for fuel extending between the inlet end and the outlet end, the manifold line being configured to provide at least a portion of a flow path for supplying fuel to the first gas turbine engine;

the inlet end of the manifold line of the first hydraulic fracturing unit is connected to an outlet of the main fuel line;

the outlet end of the manifold line of the first hydraulic fracturing unit is connected to an inlet end of a manifold line of another one of the plurality of hydraulic fracturing units, thereby providing flow communication through the manifold line of the first hydraulic fracturing unit between the main fuel line and the other one of the plurality of hydraulic fracturing units;

the communications assembly comprises a length of communications cable having a proximate end connected to a first unit interface of the first hydraulic fracturing unit and a remote end connected to a second unit interface of another hydraulic fracturing unit of the plurality of hydraulic fracturing units; and

the power cable assembly comprises a length of power cable having a first power cable end connected to a first receptacle of the first hydraulic fracturing unit and a second power cable end connected to a second receptacle of another hydraulic fracturing unit of the plurality of hydraulic fracturing units.

83. The hydraulic fracturing system of claim 82, further comprising a remote electrical power source, wherein:

the inlet end of the manifold line of the first hydraulic fracturing unit is connected to an outlet of the main fuel line;

the outlet end of the manifold line of the first hydraulic fracturing unit is connected to an inlet end of a manifold line of another one of the plurality of hydraulic fracturing units, thereby providing flow communication through the manifold line of the first hydraulic fracturing unit between the main fuel line and the other one of the plurality of hydraulic fracturing units;

the length of communications cable comprises a proximate end connected to a first unit interface of the first hydraulic fracturing unit and a remote end connected to a second unit interface of another hydraulic fracturing unit of the plurality of hydraulic fracturing units; and

the length of power cable comprises a first power cable end connected to a first receptacle of the first hydraulic fracturing unit and a second power cable end connected to the remote electrical power source.

84. The hydraulic fracturing system of claim 83, further comprising a second length of power cable comprising a first power cable end connected to the first hydraulic fracturing unit and a second power cable end coupled to another hydraulic fracturing unit of the plurality of hydraulic fracturing units.

85. The hydraulic fracturing system of claim 82, wherein:

the inlet end of the manifold line of the first hydraulic fracturing unit is connected to a fuel hub;

the outlet end of the manifold line of the first hydraulic fracturing unit is connected to a blocking device configured to prevent flow from the outlet end of the manifold line;

the length of communications cable comprises a proximate end connected to a first unit interface of the first hydraulic fracturing unit and a remote end connected to a communications hub interface connected to the data center; and

the length of power cable comprises a first power cable end connected to a first receptacle of the first hydraulic fracturing unit and a second power cable end connected to a power hub connected to a plurality of power cables of a plurality of respective hydraulic fracturing units.

86. The hydraulic fracturing system of claim 85, wherein one or more of:

the fuel hub comprises a first fuel hub, and the hydraulic fracturing system comprises one or more additional fuel hubs;

the communications hub interface comprises a first communications hub interface, and the hydraulic fracturing system comprises one or more additional communications hub interfaces; or

the power hub comprises a first power hub, and the hydraulic fracturing system comprises one or more additional power hubs.

87. The hydraulic fracturing system of claim 82, further comprising a remote electrical power source, wherein:

the inlet end of the manifold line of the first hydraulic fracturing unit is connected to a fuel hub;

the outlet end of the manifold line of the first hydraulic fracturing unit is connected to a blocking device configured to prevent flow from the outlet end of the manifold line;

the length of communications cable comprises a proximate end connected to a first unit interface of the first hydraulic fracturing unit and a remote end connected to a communications hub interface connected to the data center; and

the length of power cable comprises a first power cable end connected to a first receptacle of the first hydraulic fracturing unit and a second power cable end connected to a power hub connected to a plurality of power cables of a plurality of respective hydraulic fracturing units and the remote electrical power source.

88. The hydraulic fracturing system of claim 87, wherein one or more of:

the fuel hub comprises a first fuel hub, and the hydraulic fracturing system comprises one or more additional fuel hubs;

the communications hub interface comprises a first communications hub interface, and the hydraulic fracturing system comprises one or more additional communications hub interfaces; or

the power hub comprises a first power hub, and the hydraulic fracturing system comprises one or more additional power hubs.

89. The hydraulic fracturing system of claim 82, further comprising one or more of:
a main fuel manifold in flow communication with the fuel supply via the main fuel line;
a communications harness in communication with the data center; or
a power harness in electrical communication with a plurality of power cables of at least some of the plurality of hydraulic fracturing units,
wherein one or more of:
the inlet end of the manifold line of the first hydraulic fracturing unit is in flow communication with the main fuel manifold;
the communications cable is connected to the communications harness; or
the power cable of the first hydraulic fracturing unit is connected to the power harness.

90. The hydraulic fracturing system of claim 82, further comprising a remote electrical power source and one or more of:
a main fuel manifold in flow communication with the fuel supply via the main fuel line;
a communications harness in communication with the data center; or
a power harness in electrical communication with the remote electrical power source and a plurality of power cables of at least some of the plurality of hydraulic fracturing units,
wherein one or more of:

the inlet end of the manifold line of the first hydraulic fracturing unit is in flow communication with the main fuel manifold;

the communications cable is connected to the communications harness; or

the power cable of the first hydraulic fracturing unit is connected to the power harness.

91. The system of claim 70, wherein the distribution line is connected to the manifold line and the first gas turbine engine and is configured to provide flow communication solely between the manifold line and the first gas turbine engine.

92. The hydraulic fracturing unit of claim 79, wherein the distribution line is connected to the manifold line and the gas turbine engine and is configured to provide flow communication solely between the manifold line and the gas turbine engine.

93. The hydraulic fracturing system of claim 81, wherein fuel line connection assembly includes a manifold line and a distribution line, and the distribution line is connected to the manifold line and the first gas turbine engine and is configured to provide flow communication solely between the manifold line and the first gas turbine engine.

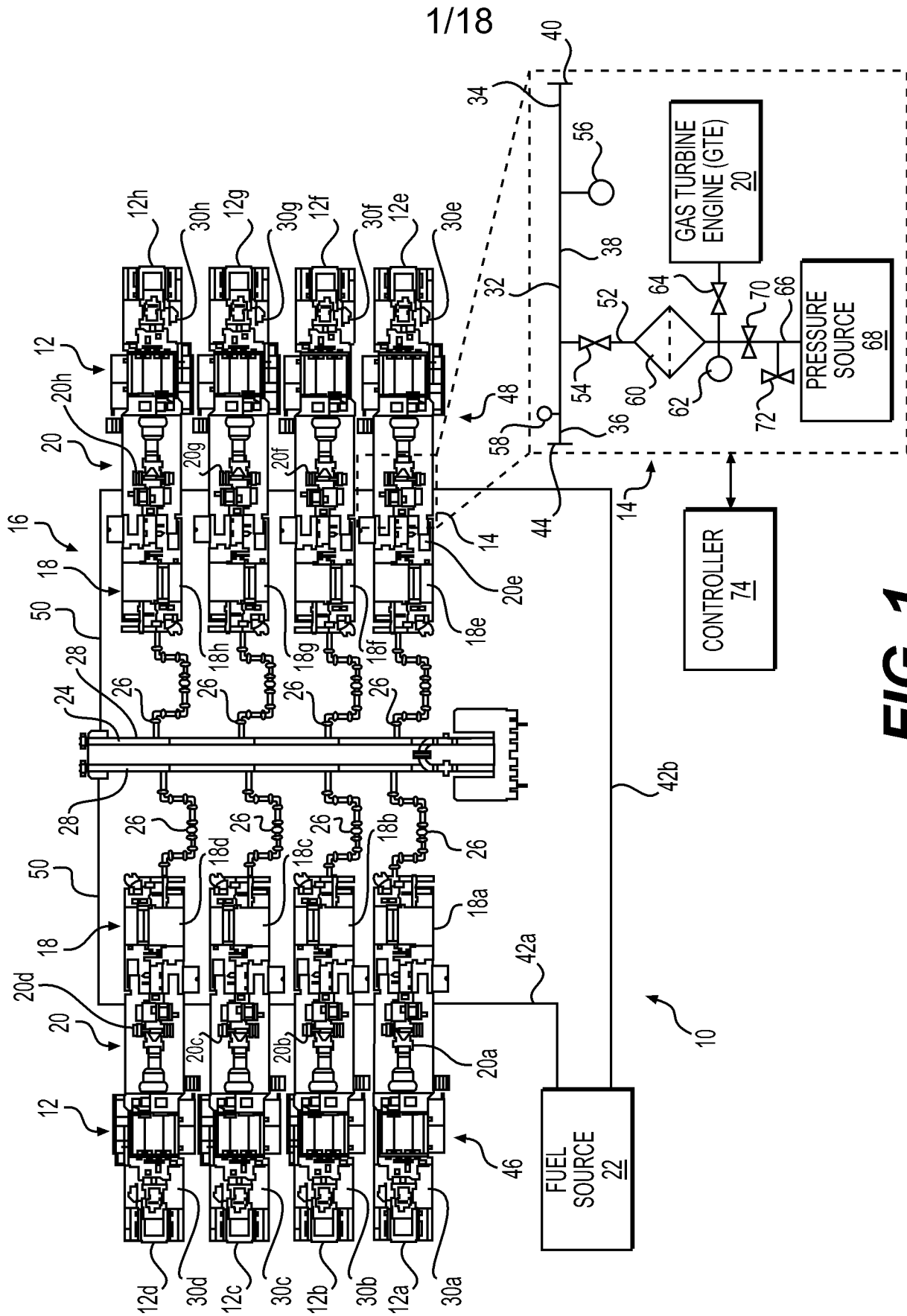


FIG. 1

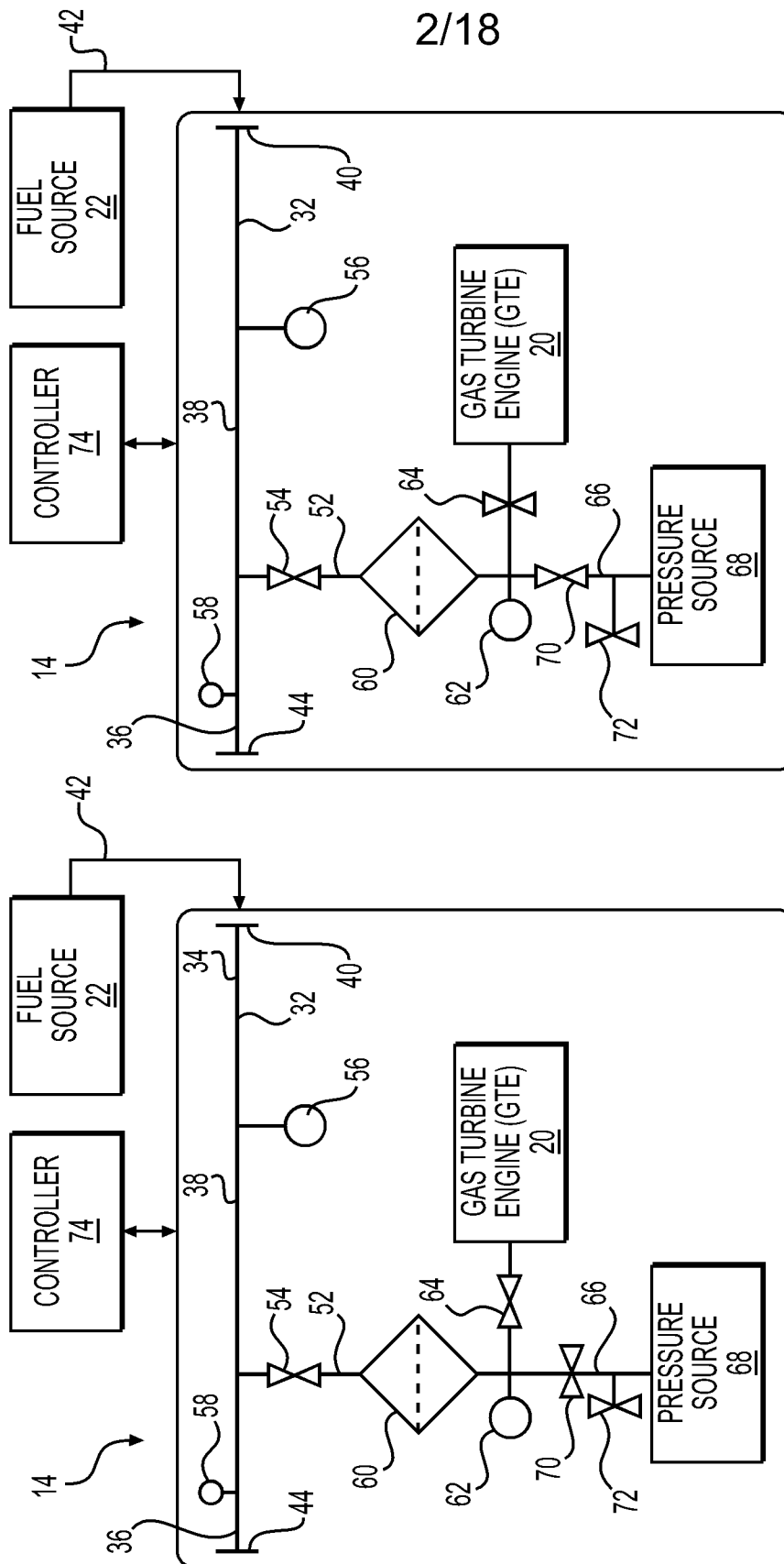


FIG. 2A

FIG. 2B

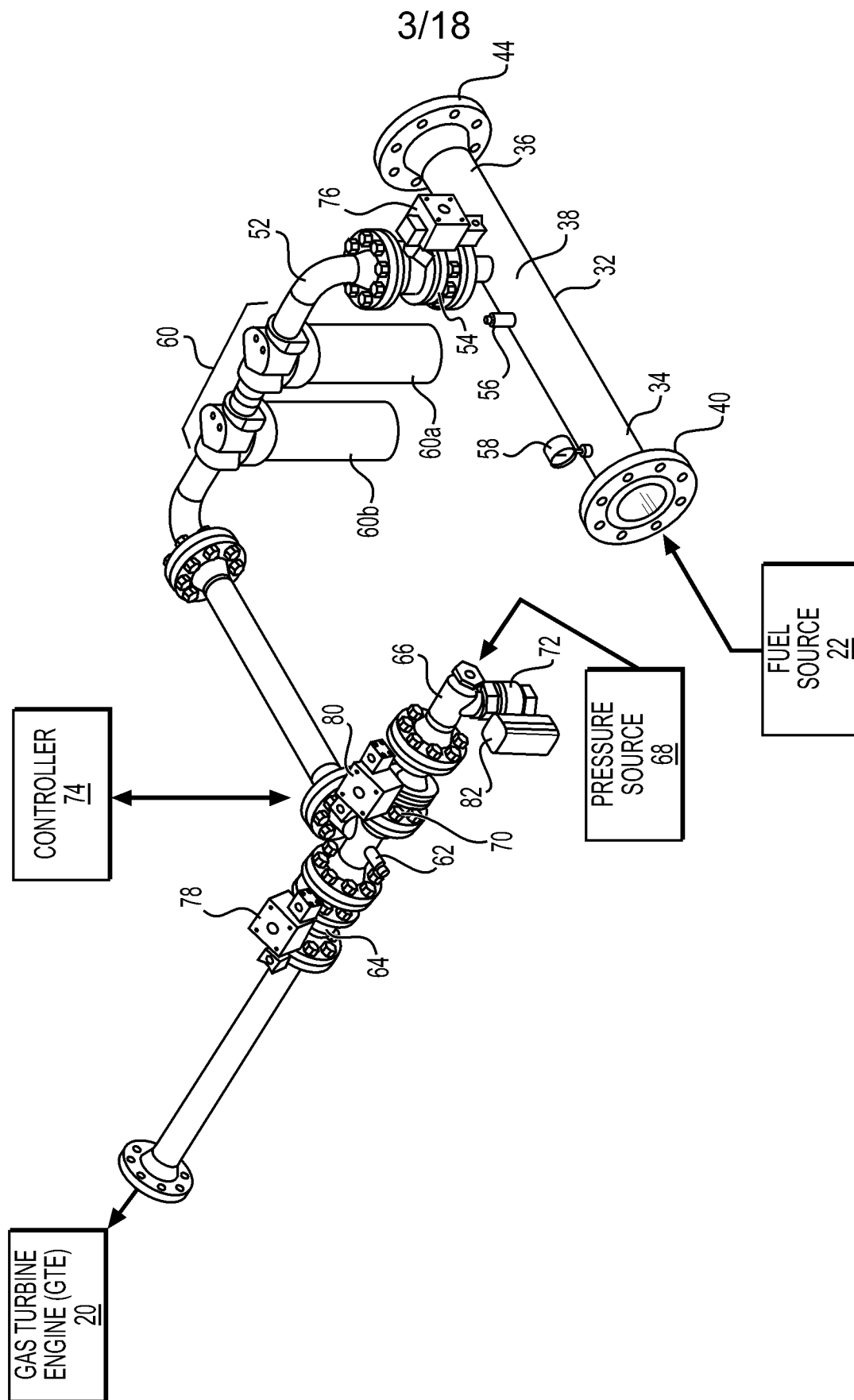
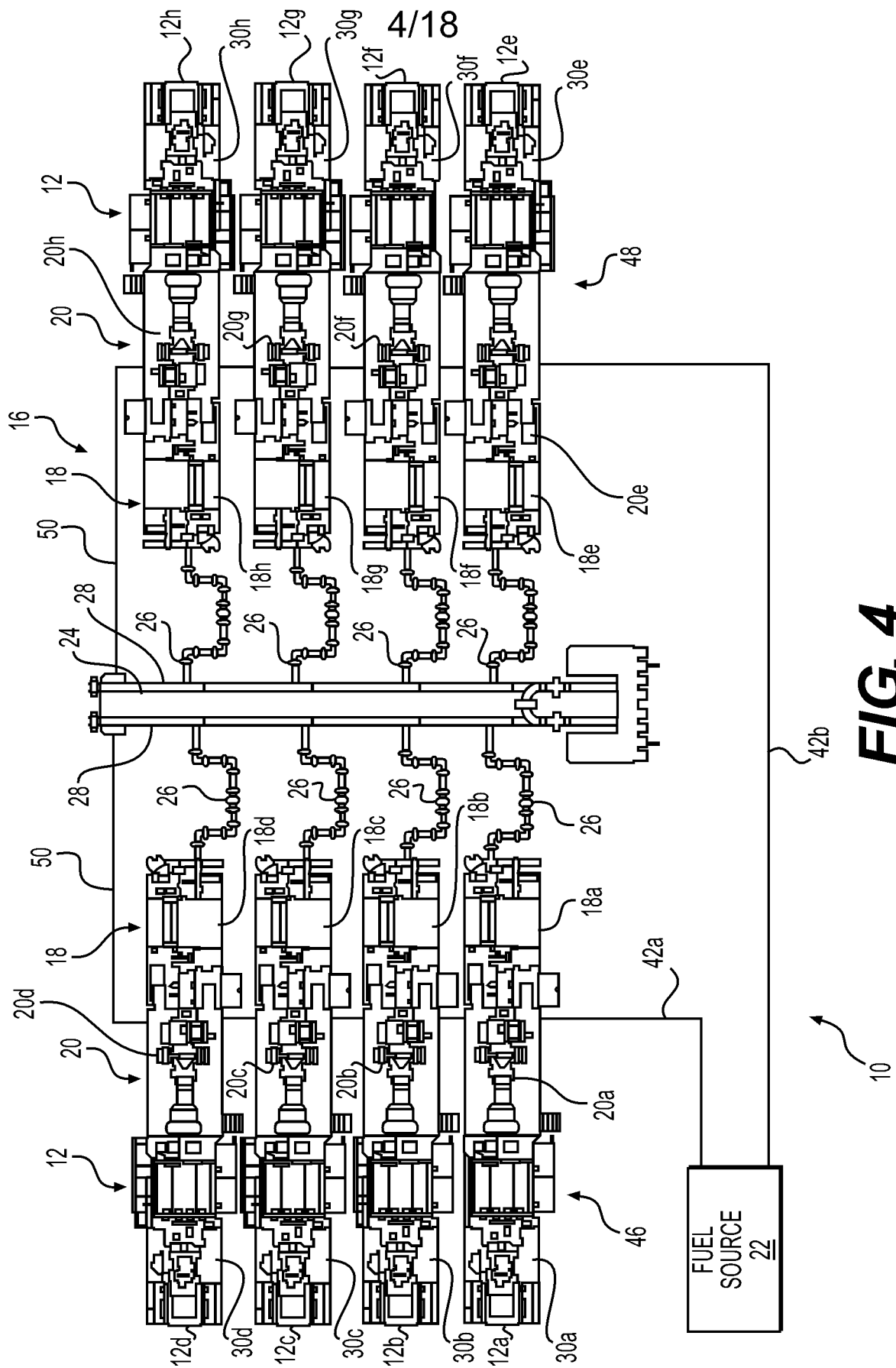


FIG. 3



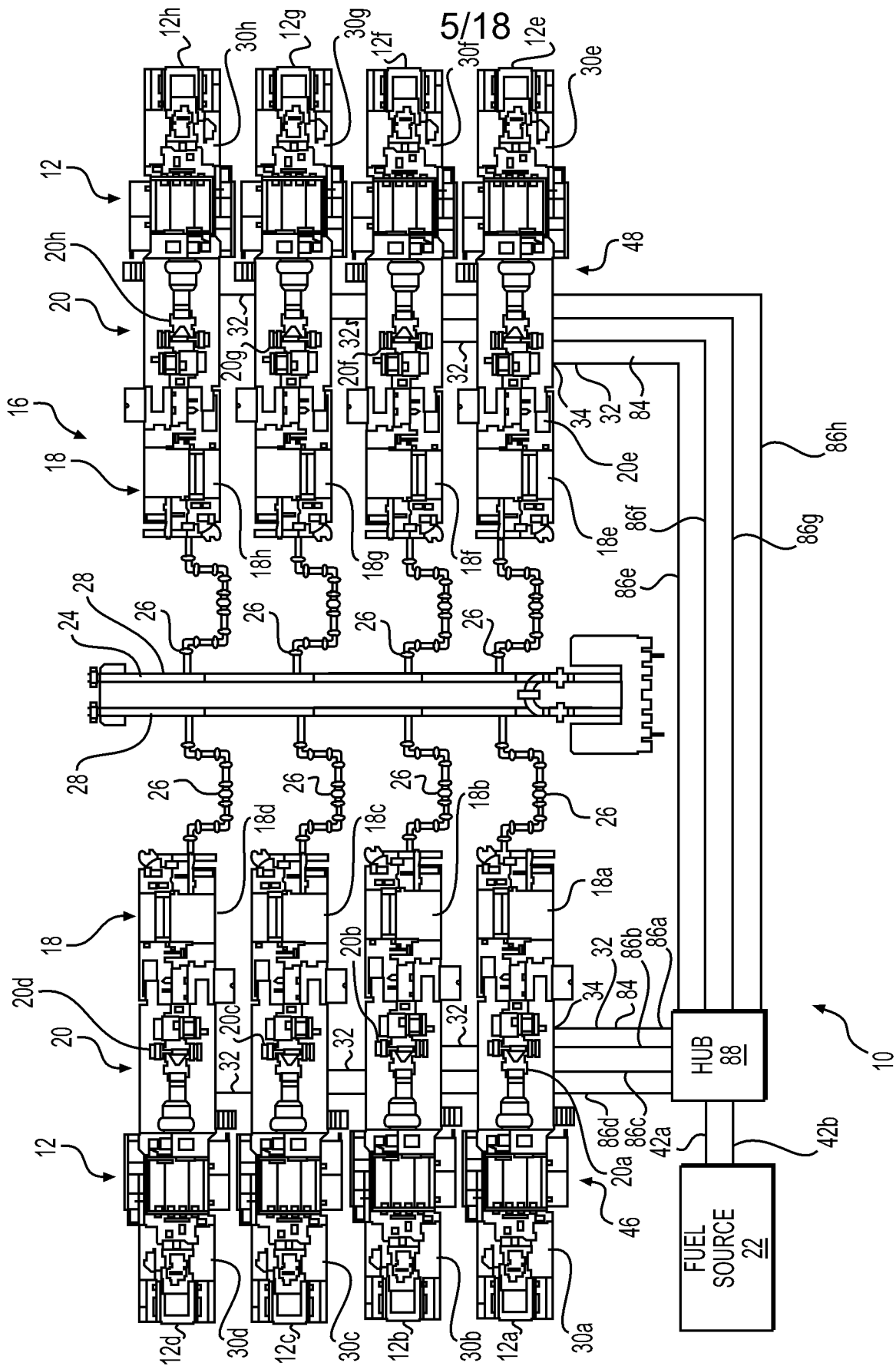
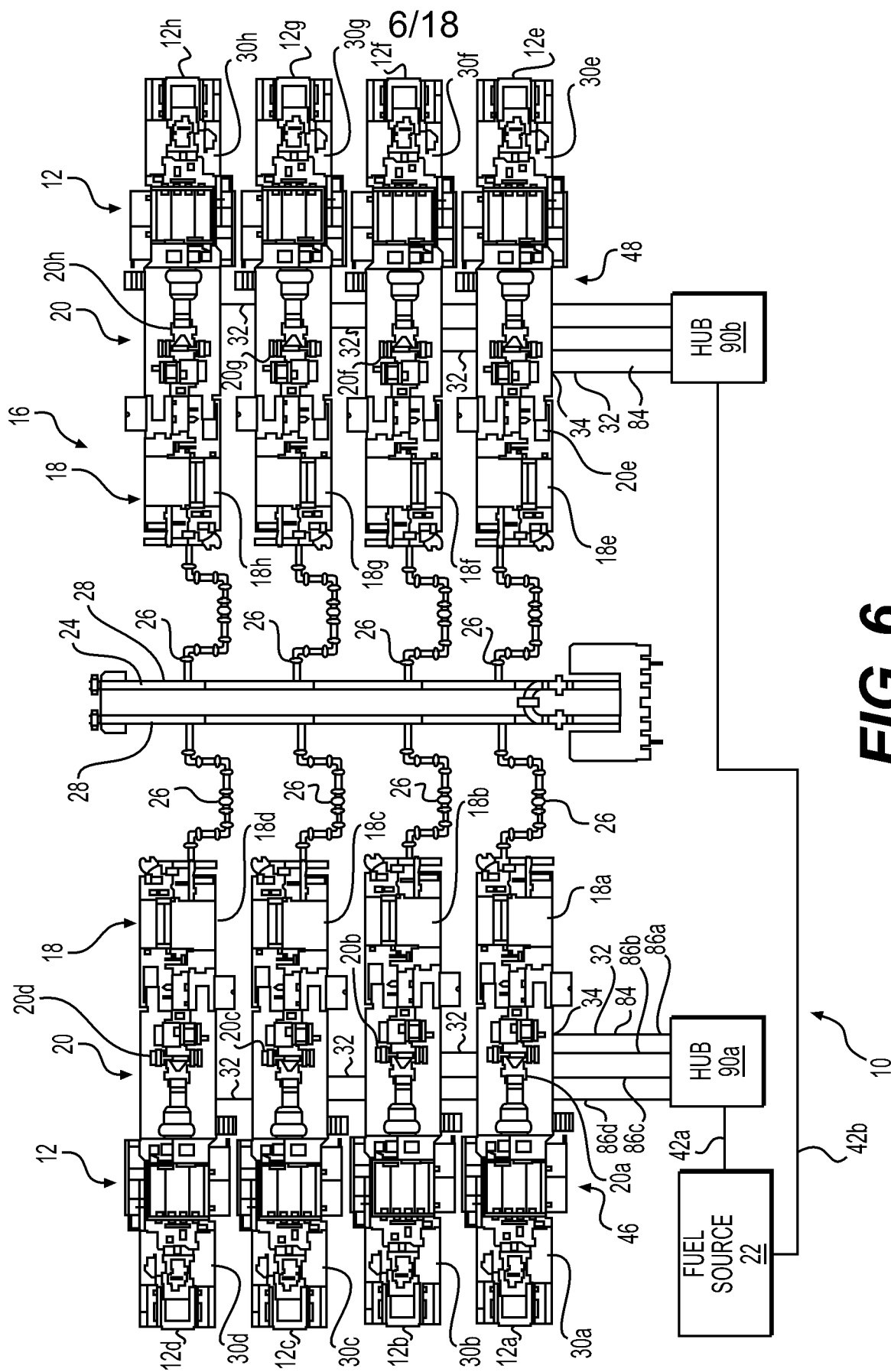


FIG. 5



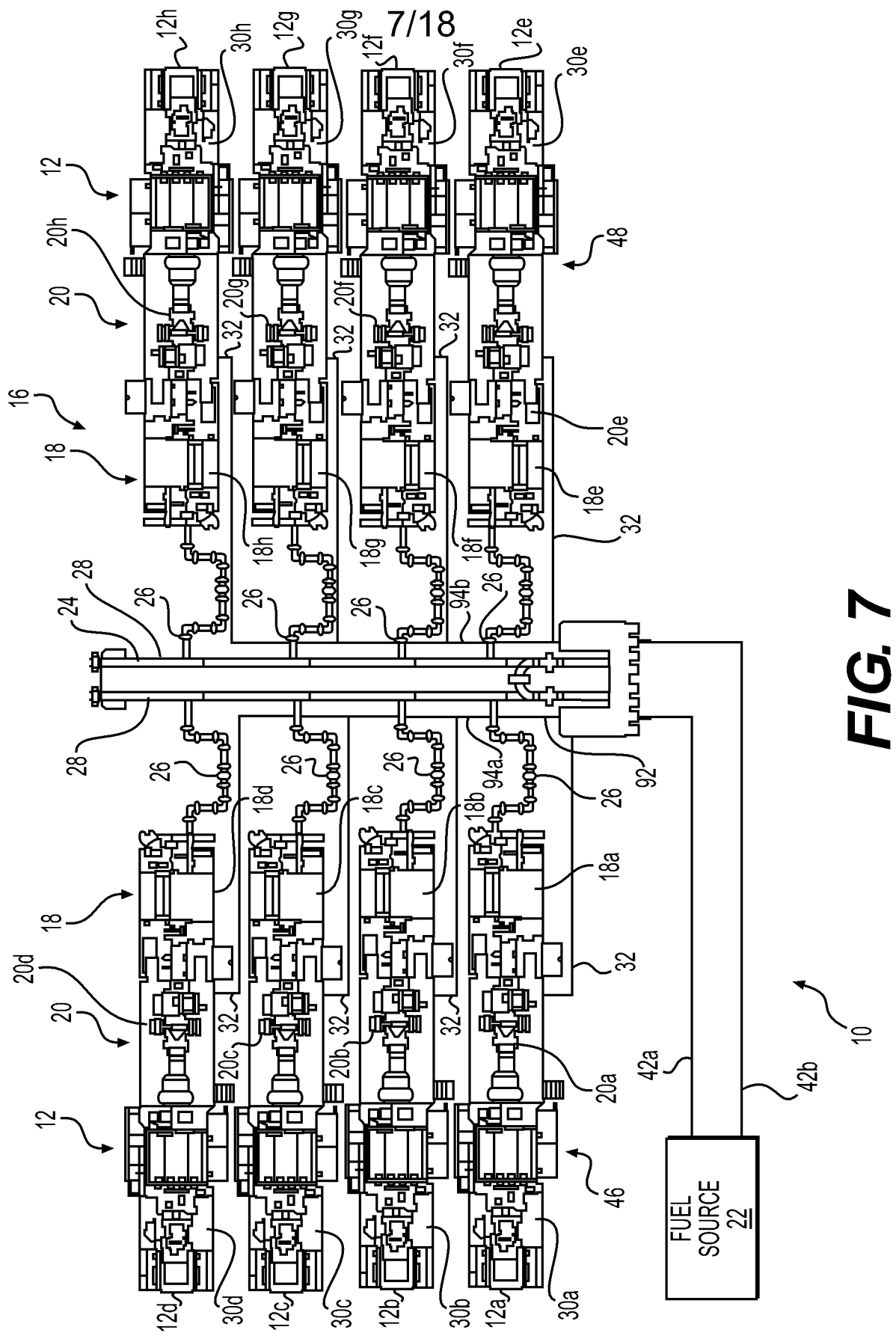
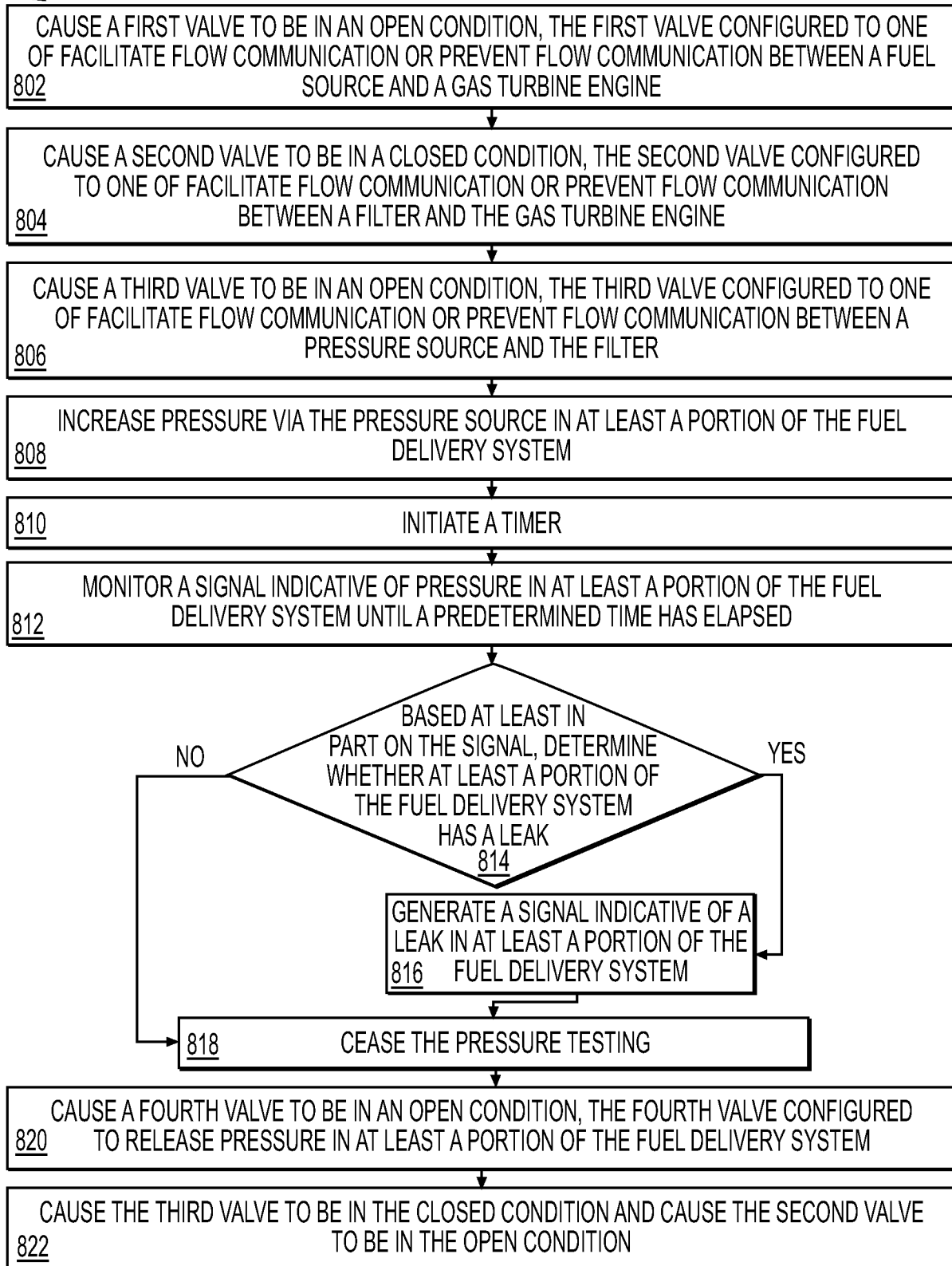


FIG. 7

800

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**FIG. 8**

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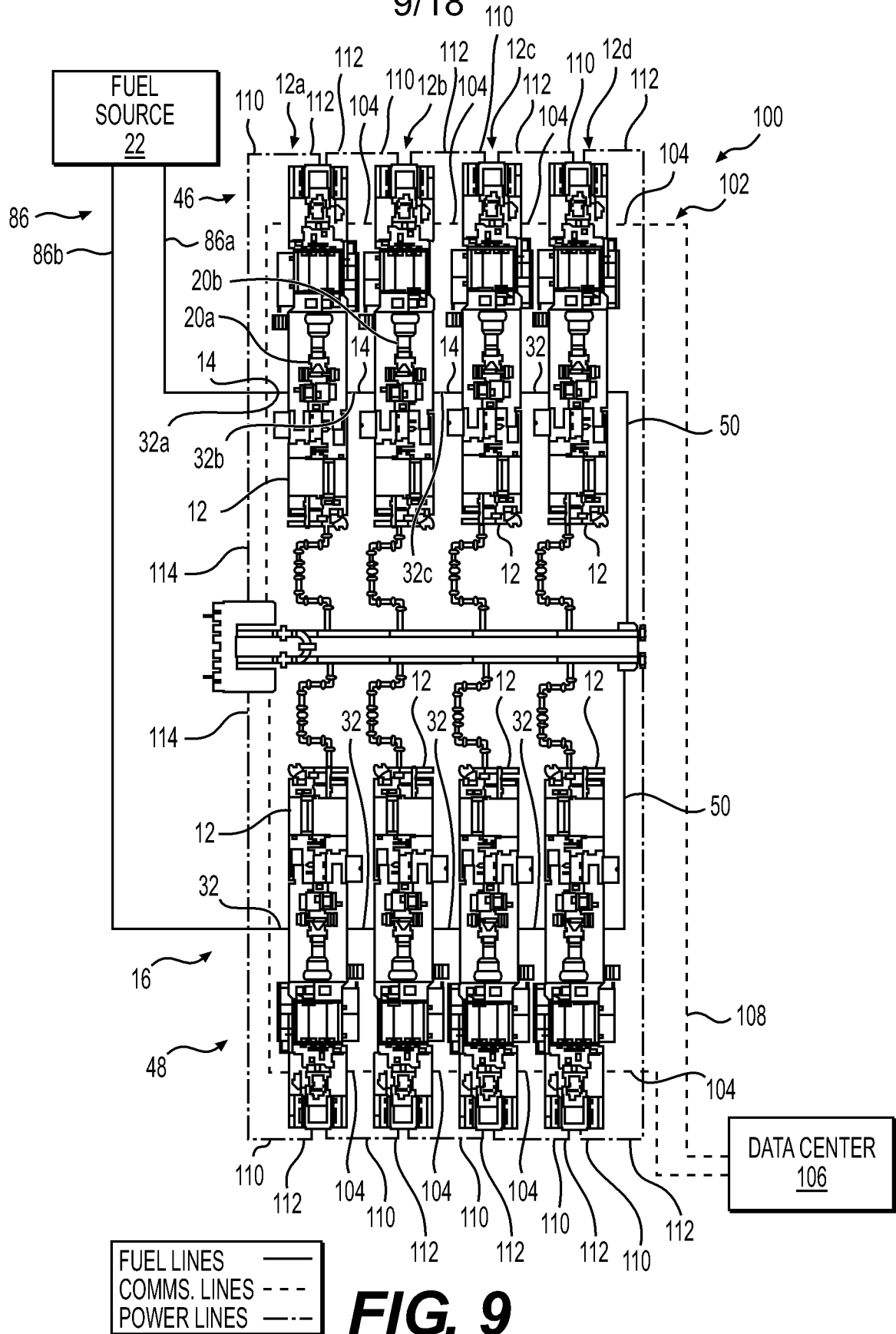
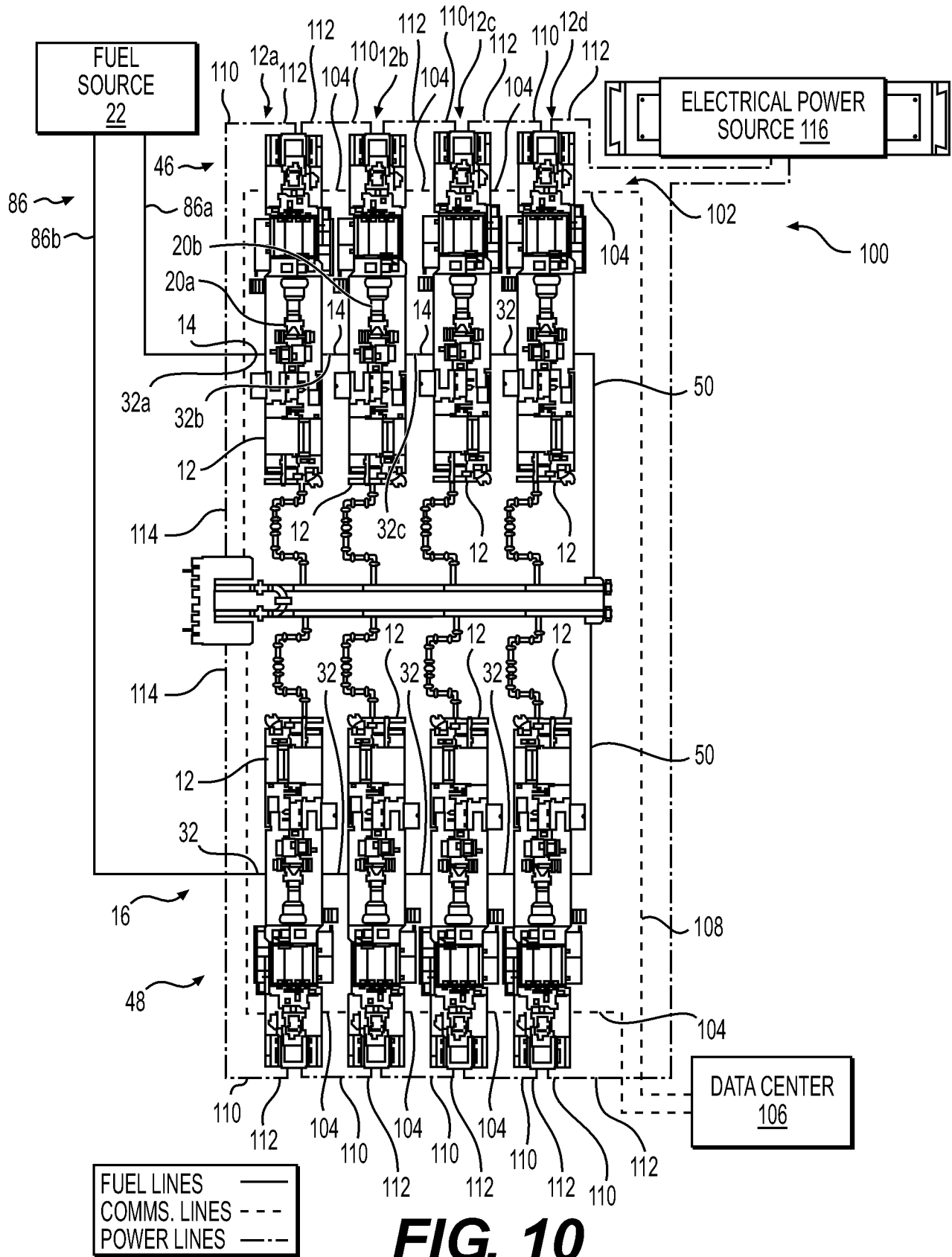
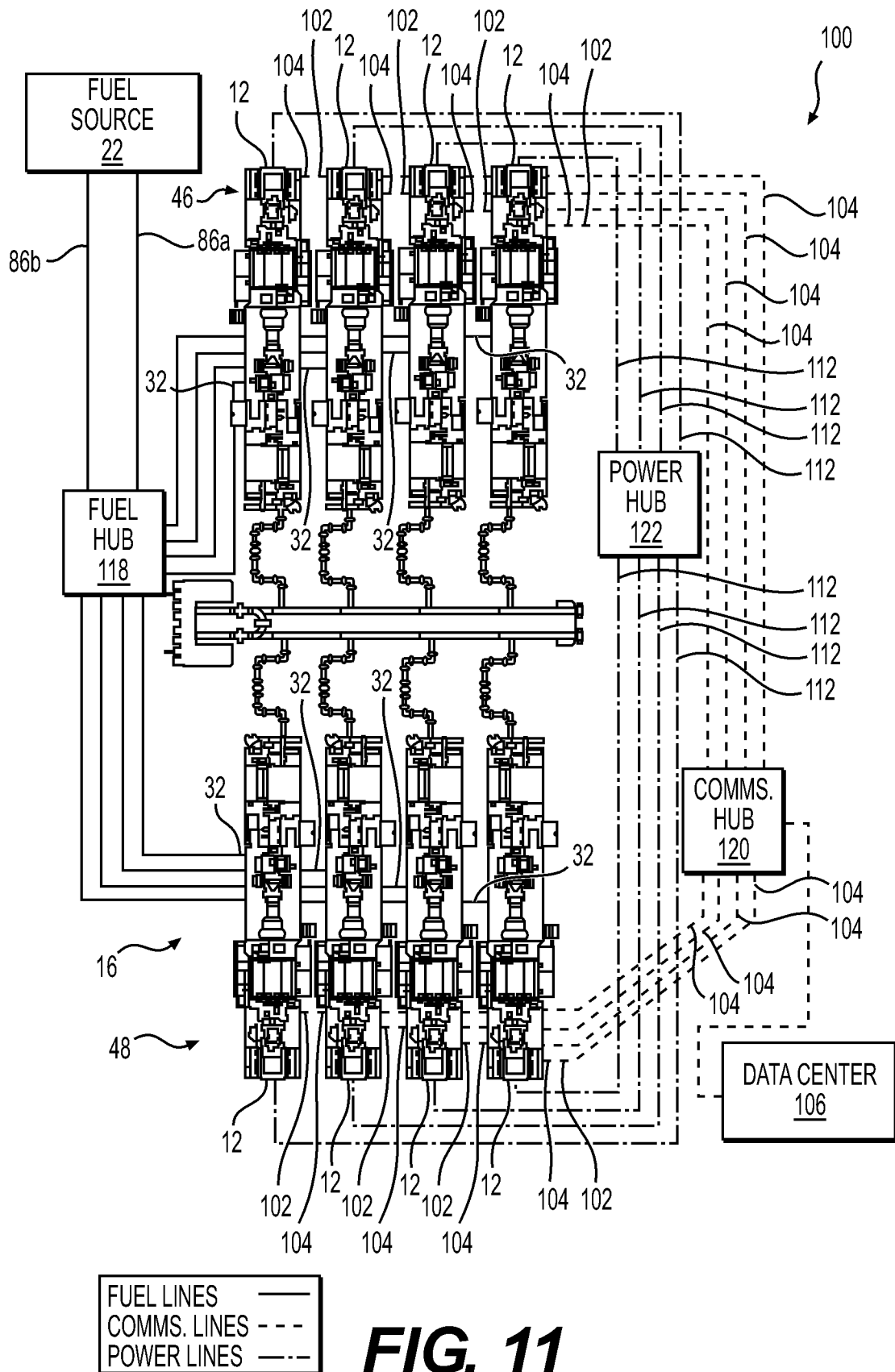


FIG. 9

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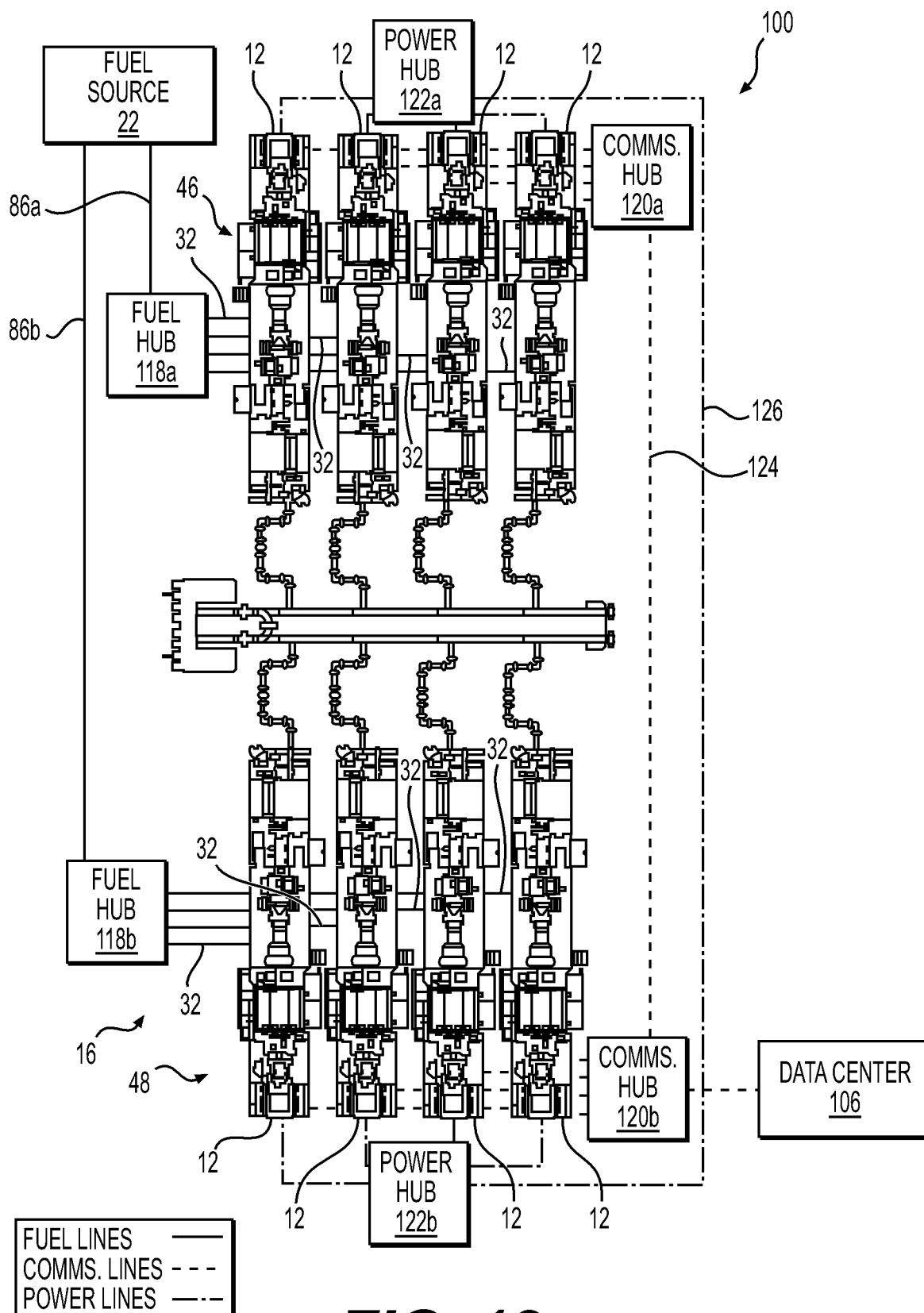


FIG. 12

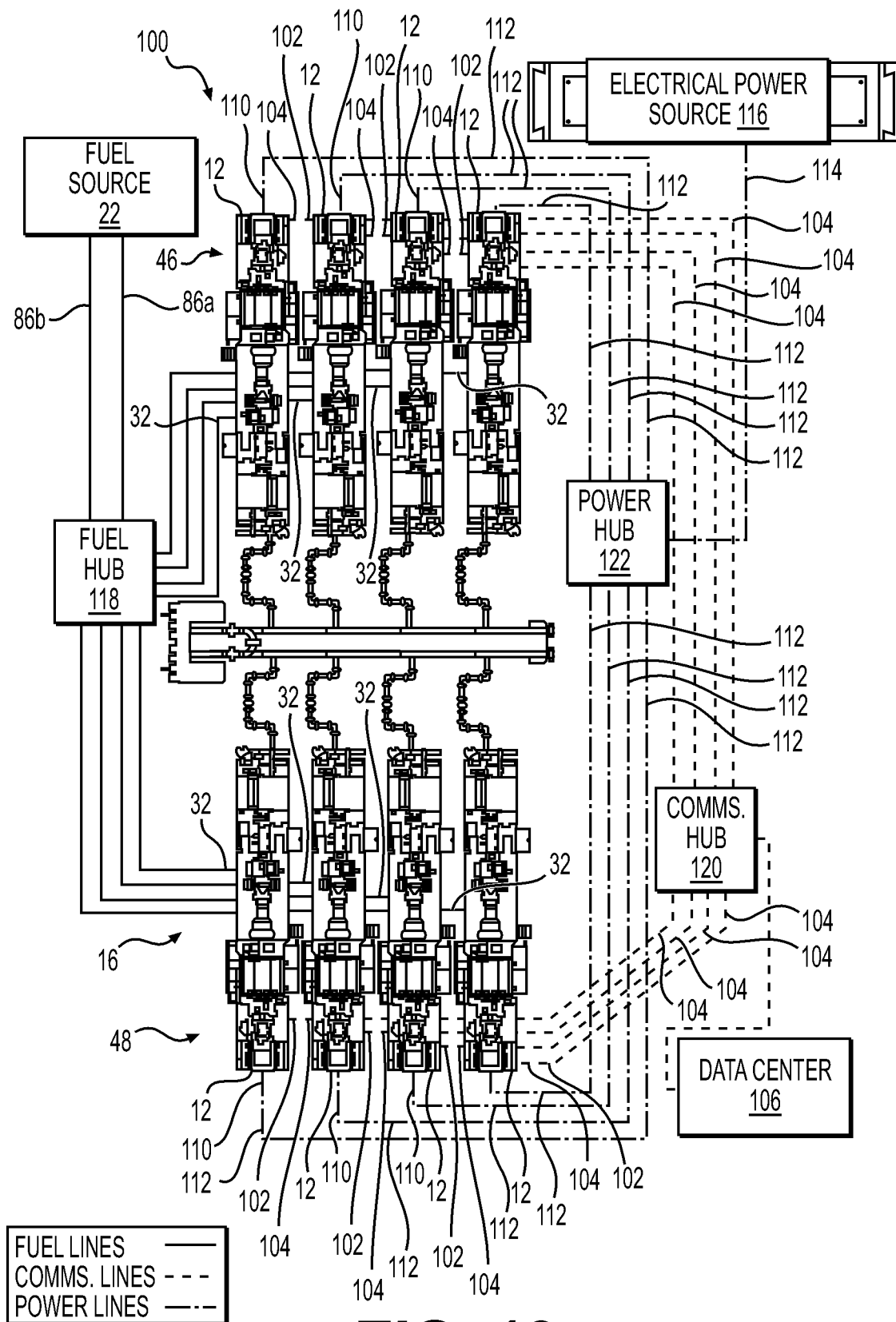
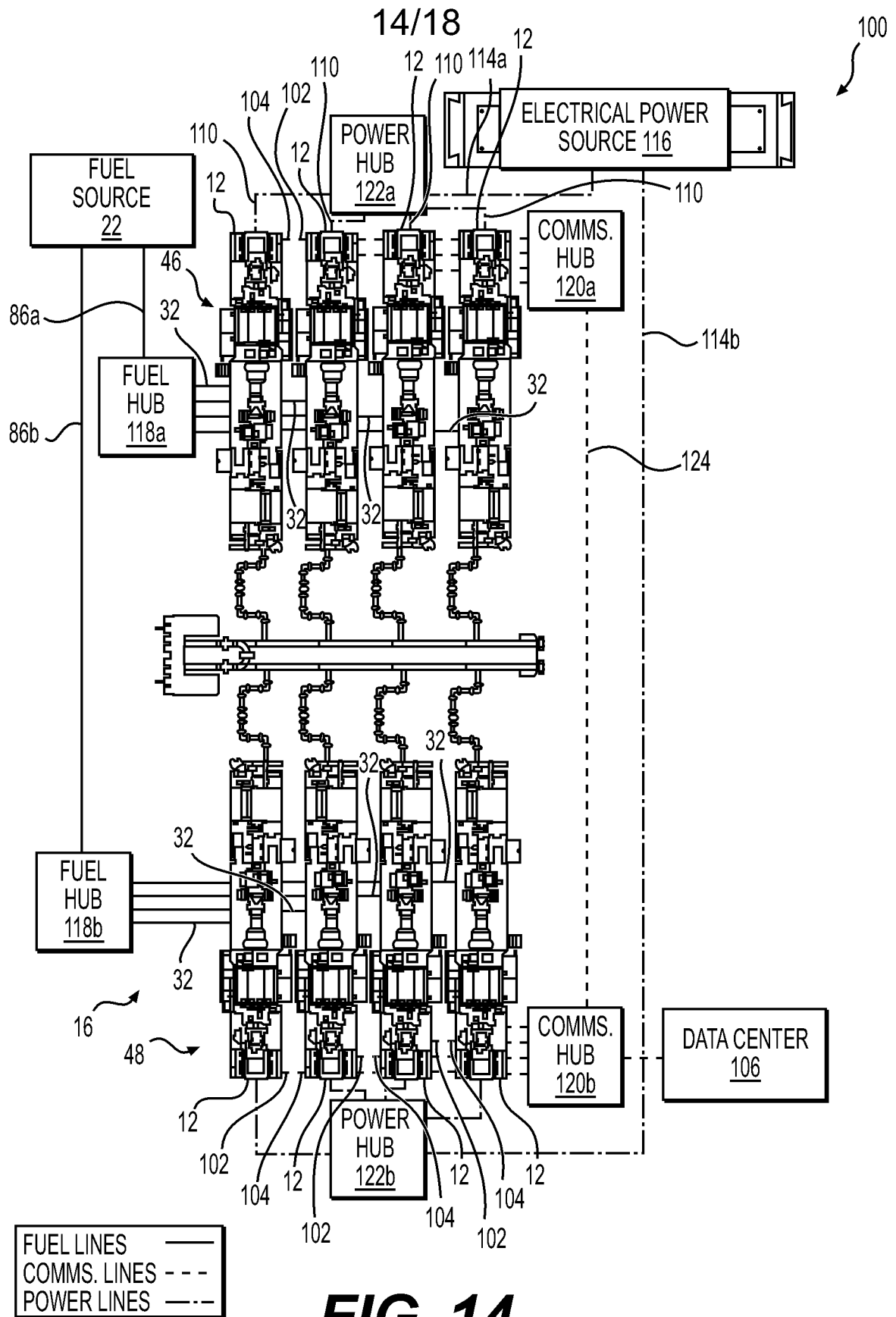


FIG. 13



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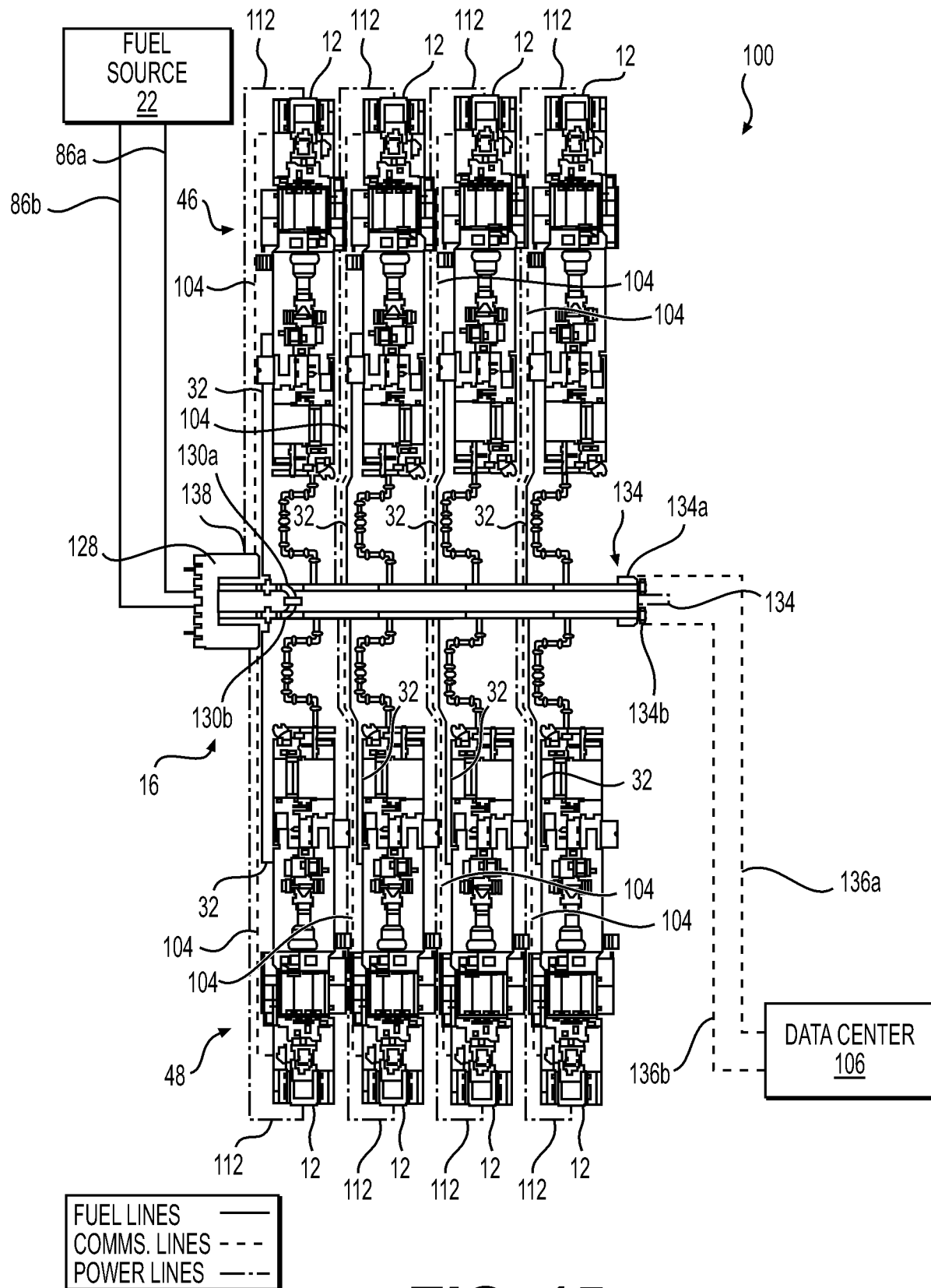


FIG. 15

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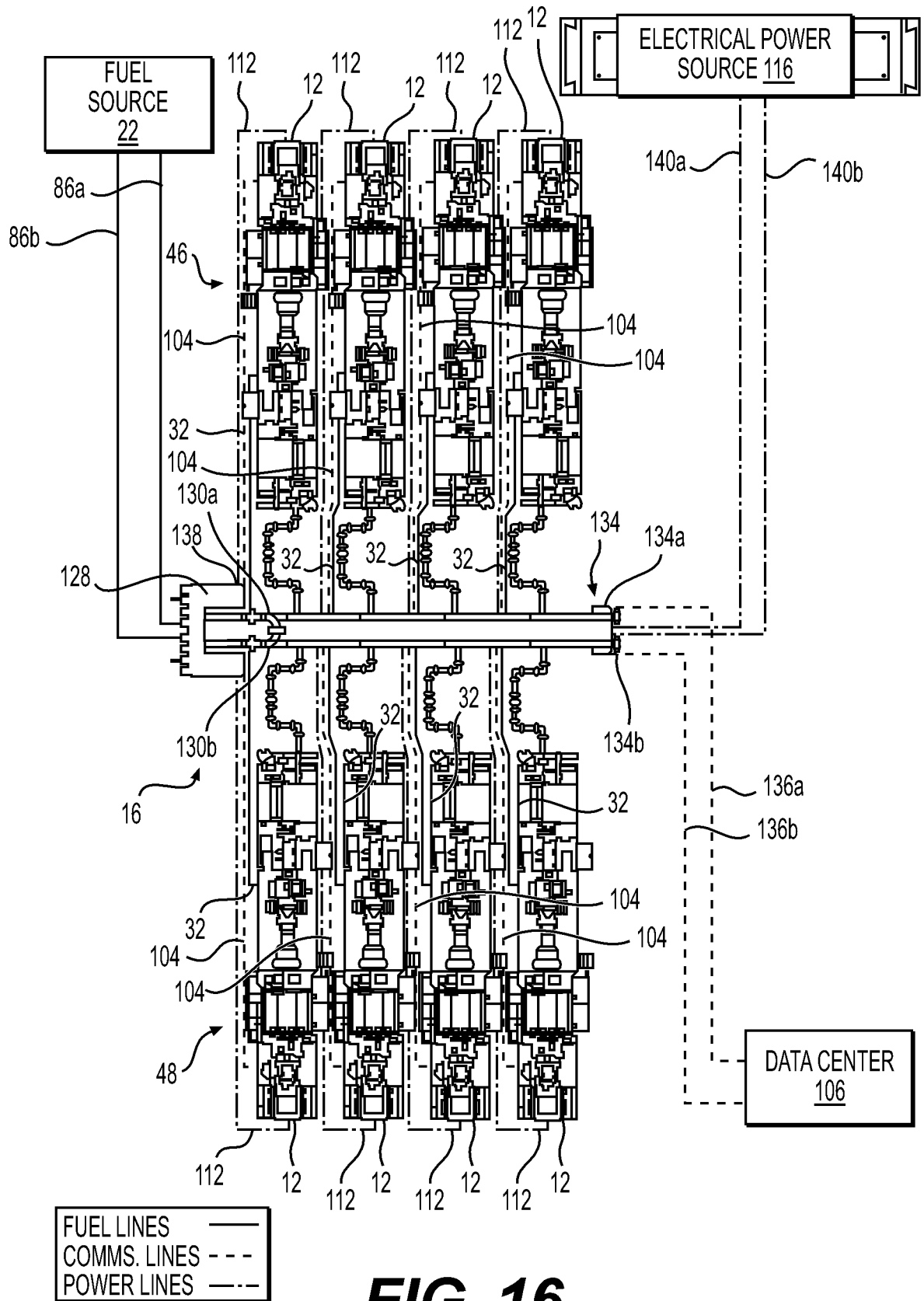
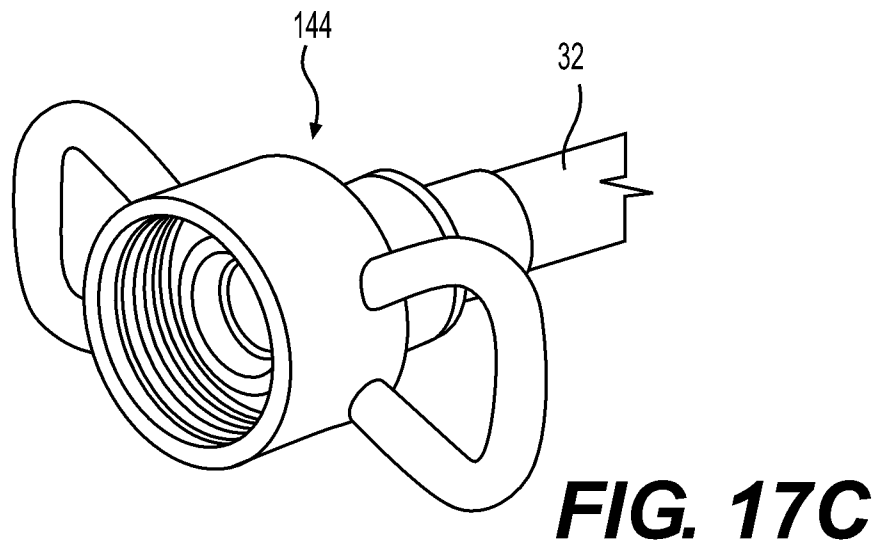
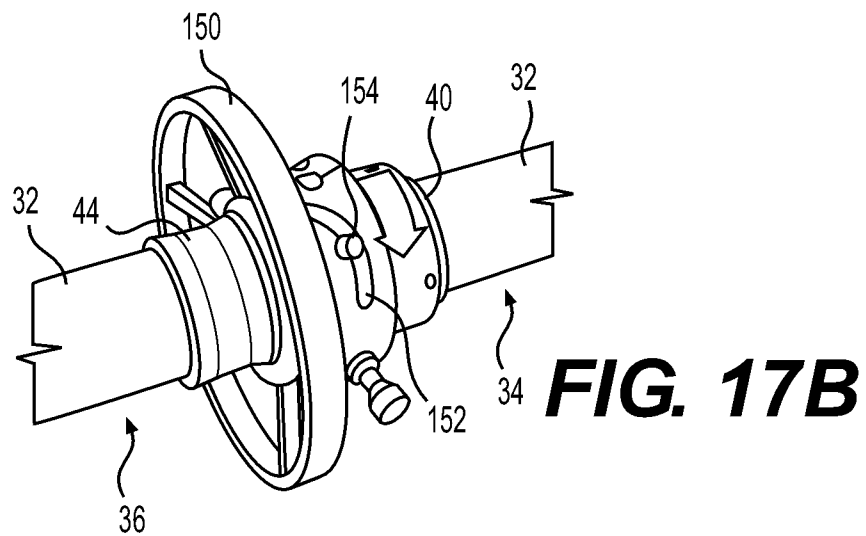
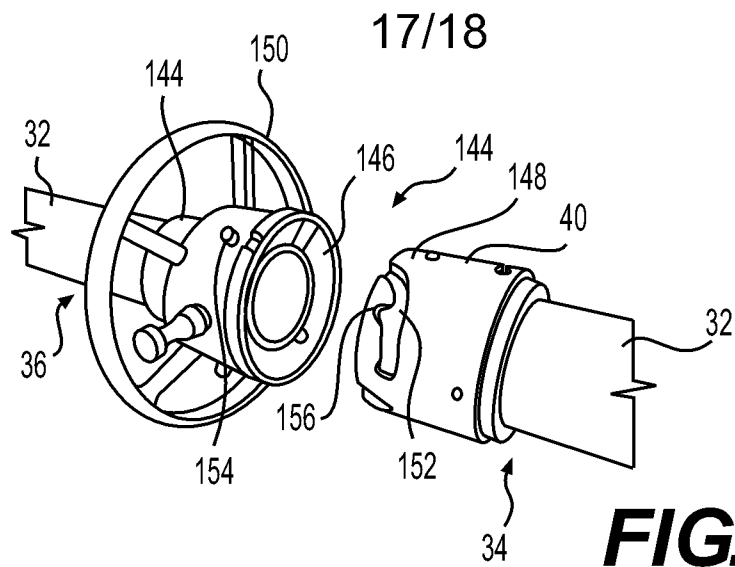


FIG. 16



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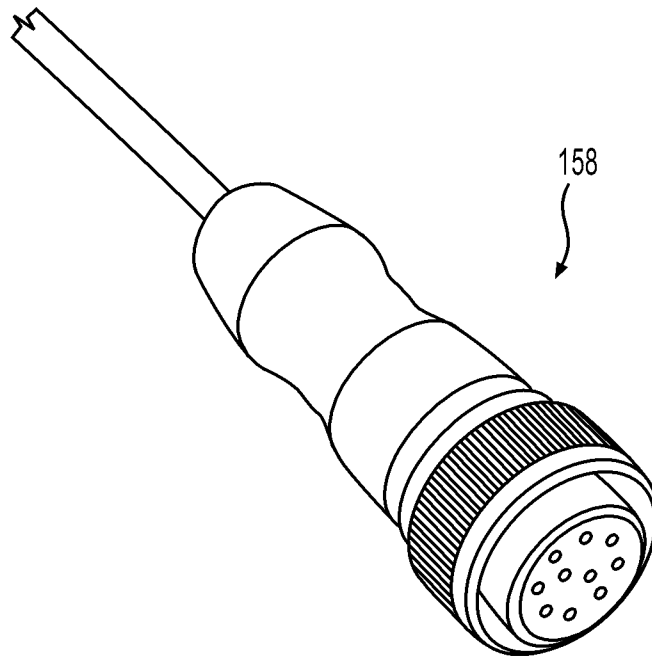


FIG. 18

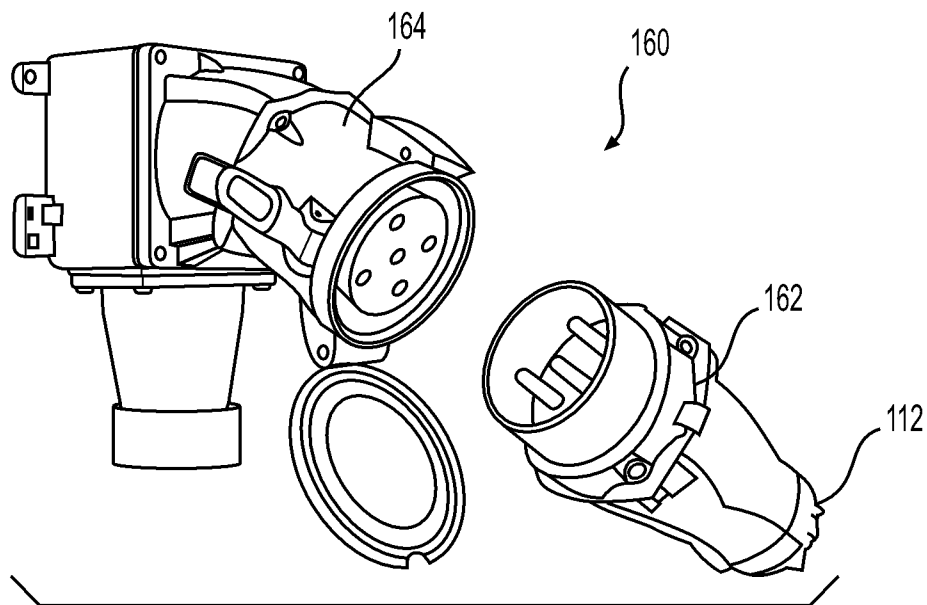


FIG. 19

