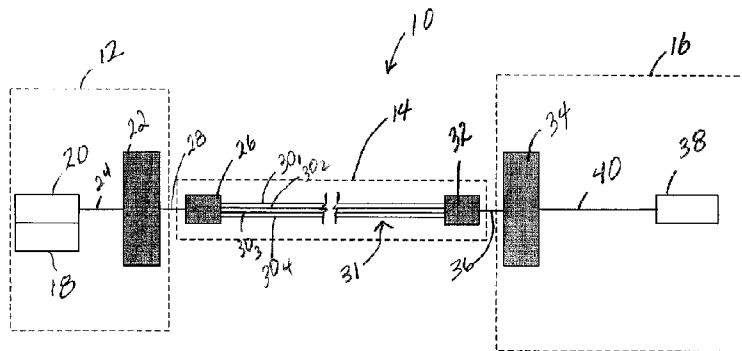




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(54) Title: MODULAR REMOTE POWER GENERATION AND TRANSMISSION FOR HYDRAULIC FRACTURING SYSTEM



(57) **Abrégé/Abstract:**

A hydraulic fracturing system for fracturing a subterranean formation includes a power generation system, a transmission section, and an equipment load section. The power generation system includes a turbine generator that generates electricity that is used to power equipment in the equipment load section. The equipment in the equipment load section conditions and pressurizes fluid that is injected into a wellbore for fracturing the formation. The power generation and equipment load sections are distal from one another and are separated by a long distance. The transmission section connects the power generation and equipment load sections, and thus spans the long distance between these sections.

ABSTRACT

A hydraulic fracturing system for fracturing a subterranean formation includes a power generation system, a transmission section, and an equipment load section. The power generation system includes a turbine generator that generates electricity that is used to power equipment in the equipment load section. The equipment in the equipment load section conditions and pressurizes fluid that is injected into a wellbore for fracturing the formation. The power generation and equipment load sections are distal from one another are separated by a long distance. The transmission section connects the power generation and equipment load sections, and thus spans the long distance between these sections.

**MODULAR REMOTE POWER GENERATION AND TRANSMISSION FOR
HYDRAULIC FRACTURING SYSTEM**

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to and the benefit of U.S. Provisional Patent Application Serial No. 62/180,140 filed June 16, 2015.

BACKGROUND OF THE INVENTION

1. Field of Invention

[0002] The present disclosure relates to hydraulic fracturing of subterranean formations. In particular, the present disclosure relates to a method and device for remotely generating and transmitting power for hydraulic fracturing of a subterranean formation.

2. Description of Prior Art

[0003] Hydraulic fracturing is a technique used to stimulate production from some hydrocarbon producing wells. The technique usually involves injecting fluid into a wellbore at a pressure sufficient to generate fissures in the formation surrounding the wellbore. Typically the pressurized fluid is injected into a portion of the wellbore that is pressure isolated from the remaining length of the wellbore so that fracturing is limited to a designated portion of the formation. The fracturing fluid slurry, whose primary component is usually water, includes proppant (such as sand or ceramic) that migrate into the fractures with the fracturing fluid slurry

and remain to prop open the fractures after pressure is no longer applied to the wellbore. Sometimes, nitrogen, carbon dioxide, foam, diesel, or other fluids are used as the primary component instead of water. A typical hydraulic fracturing fleet may include a data van unit, blender unit, hydration unit, chemical additive unit, hydraulic fracturing pump unit, sand equipment, wireline, and other equipment.

[0004] Traditionally, the fracturing fluid slurry has been pressurized on surface by high pressure pumps powered by diesel engines. To produce the pressures required for hydraulic fracturing, the pumps and associated engines have substantial volume and mass. Heavy duty trailers, skids, or trucks are required for transporting the large and heavy pumps and engines to sites where wellbores are being fractured. Each hydraulic fracturing pump usually includes power and fluid ends, seats, valves, springs, and keepers internally. These parts allow the pump to draw in low pressure fluid (approximately 100 psi) and discharge the same fluid at high pressures (up to 15,000 psi or more). The diesel engines and transmission which power hydraulic fracturing units typically generate large amounts of vibrations of both high and low frequencies. These vibrations are generated by the diesel engine, the transmission, the hydraulic fracturing pump as well as the large cooling fan and radiator needed to cool the engine and transmission. Low frequency vibrations and harshness are greatly increased by the large cooling fans and radiator required to cool the diesel engine and transmission. In addition, the diesel engine and transmission are coupled to the hydraulic fracturing pump through a u-joint drive shaft, which requires a three degree offset from the horizontal output of the transmission to the horizontal input of the hydraulic fracturing pump. Diesel powered hydraulic fracturing units are known to jack and jump while operating in the field from the large amounts of vibrations. The vibrations may contribute to fatigue failures of many differed parts of a hydraulic fracturing unit. Recently

electrical motors have been introduced to replace the diesel motors, which greatly reduces the noise generated by the equipment during operation. Because of the high pressures generated by the pumps, and that the pumps used for pressurizing the fracturing fluid are reciprocating pumps, a significant amount of vibration is created when pressurizing the fracturing fluid. The vibration transmits to the piping that carries the fracturing fluid and its associated equipment, thereby increasing probabilities of mechanical failure for the piping and equipment, and also shortening their useful operational time.

SUMMARY OF THE INVENTION

[0005] Disclosed herein is an example of a hydraulic fracturing system for fracturing a subterranean formation which includes an electric motor, a pump coupled to the motor, and that has a discharge in fluid communication with a wellbore that intersects the formation, so that when the motor is activated and drives the pump, pressurized fluid from the pump pressurizes the wellbore to fracture the formation, a variable frequency drive in communication with the electric motor, and that controls the speed of the motor, and performs electric motor diagnostics to prevent damage to the electric motor, a source of electricity that is disposed a long distance from the electric motor, and transmission lines that connect the source of electricity to the electric motor and that span the long distance between the source of electricity and the electric motor. The system can further include a transformer between the transmission line and the source of electricity as well as a transformer between the transmission line and the electric motor. The source of electricity can be a utility outlet, a turbine generator, or a generator powered by any other source. An electric equipment room can be included that is in communication with the turbine generator and which controls operation of the turbine generator. A switch gear can optionally be included between the transmission line and the source of electricity, and another switch gear can be included between the transmission line and the electric motor. In this example, a transformer can be disposed between the switch gear and the electric motor. The electric motor can be a first electric motor, in this embodiment the system further includes a multiplicity of electric motors disposed at different locations, and wherein the transmission lines are selectively moveable at different times to provide electrical communication between the source of electricity and the multiplicity of motors.

[0006] Another example of a hydraulic fracturing system for fracturing a subterranean formation disclosed herein is made up of a power generation section, an equipment load section that is a long distance from the power generation section, and which has an electric motor and a pump driven by the electric motor and that has a fluid discharge in communication with a wellbore that intersects the formation. The system also includes a power transmission section that extends between the power generation section and the equipment load section, and through which the power generation section and equipment load section are in electrical communication. The system can include a variable frequency drive in communication with the electric motor, and that controls the speed of the motor, and performs electric motor diagnostics to prevent damage to the electric motor. Lines can be included that provide electrical communication from the transmission section to electrically powered equipment disposed in the equipment load section, and wherein the lines make up a micro grid. The power generation section can include a turbine that is powered by natural gas and that is coupled to a generator. In an alternative, the transmission section has a set of transmission lines, wherein electricity at different phases is transmitted along different lines in the set of lines. Optionally, a one of the lines is a neutral line.

[0007] Also described herein is a method of fracturing a subterranean formation and which includes driving a pump with an electrical motor, transmitting electricity to the electrical motor from a power source that is a long distance from the electrical motor, pressurizing a fluid with the pump to form a pressurized fluid, and fracturing the subterranean formation by directing the pressurized fluid to a wellbore that intersects the subterranean formation. The method can also include controlling a speed of the motor with a variable frequency drive, as well as performing diagnostics on the electric motor. In one example, a voltage of the electricity proximate the power source is increased with a transformer, and the voltage of the electricity is decreased

proximate the electric motor. Optionally, electrical communication can be suspended between the power source and the electrical motor with one of a cutout or a switch gear. In an embodiment, the electrical motor is a first electrical motor, the pump is a first pump, the wellbore is a first wellbore, and the subterranean formation is a first subterranean formation; in this example transmitting electricity to the electrical motor includes transmitting electricity across a transmission section that has an end in electrical communication with the power source, and another end that is in electrical communication with the first electrical motor, here the method also includes disconnecting the end of the transmission section that is in communication with the first electrical motor and reconnecting that end to a second electrical motor is a long distance from the power supply and that is connected to a second pump, and pressurizing fluid with the second pump and directing the pressurized fluid to a second wellbore for fracturing a second subterranean formation. The power source can be a power generation section that includes devices such as a utility outlet, a turbine generator, and an electrical equipment room.

BRIEF DESCRIPTION OF DRAWINGS

[0008] Some of the features and benefits of the present invention having been stated, others will become apparent as the description proceeds when taken in conjunction with the accompanying drawings, in which:

[0009] FIG. 1 is a schematic of an example of a hydraulic fracturing system having power generation, power transmission, and power load sections.

[0010] FIG. 2 is a schematic of an example of a power generation section for use in the hydraulic fracturing system of FIG. 1.

[0011] FIG. 3 is a schematic of an example of a power load section for use in the hydraulic fracturing system of FIG. 1.

[0012] FIG. 4 is a schematic of an alternate example of the hydraulic fracturing system of FIG. 1.

[0013] FIG. 5 is a schematic of an alternate example of the hydraulic fracturing system of FIG. 1 having multiple equipment load sections.

[0014] While the invention will be described in connection with the preferred embodiments, it will be understood that it is not intended to limit the invention to that embodiment. On the contrary, it is intended to cover all alternatives, modifications, and equivalents, as may be included within the spirit and scope of the invention as defined by the appended claims.

DETAILED DESCRIPTION OF INVENTION

[0015] The method and system of the present disclosure will now be described more fully hereinafter with reference to the accompanying drawings in which embodiments are shown. The method and system of the present disclosure may be in many different forms and should not be construed as limited to the illustrated embodiments set forth herein; rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey its scope to those skilled in the art. Like numbers refer to like elements throughout. In an embodiment, usage of the term “about” includes +/- 5% of the cited magnitude. In an embodiment, usage of the term “substantially” includes +/- 5% of the cited magnitude.

[0016] It is to be further understood that the scope of the present disclosure is not limited to the exact details of construction, operation, exact materials, or embodiments shown and described, as modifications and equivalents will be apparent to one skilled in the art. In the drawings and specification, there have been disclosed illustrative embodiments and, although specific terms are employed, they are used in a generic and descriptive sense only and not for the purpose of limitation.

[0017] Shown in Figure 1 is a schematic example of a hydraulic fracturing system 10, and which includes a power generation section 12, a transmission section 14, and an equipment load section 16. A electricity source 18 shown in the power generation section 12 for providing electricity to the equipment load section 16. Examples of the electricity source 18 include a utility outlet or a generator; which is used to generate electricity, and in one embodiment the generator converts mechanical energy into electrical energy which is transmitted across the transmission section 14 to power devices in the equipment load section 16. Other embodiments of the electricity source

18 include a turbine generator as well as a diesel powered motor coupled with a generator. An electrical equipment room (“EER”) 20 is shown disposed adjacent the electricity source 18, and which controls operation of the electricity source 18 when the electricity source 18 is a turbine generator. Examples of controlling operation of the electricity source 18 include monitoring operational parameters of the turbine generator; such as its operating conditions (*i.e.* rpm and temperature), its electrical output, electrical phase angles, and its energy input, and adjusting operations of the turbine generator based on the monitored conditions; as well as start-up and shut-down of the turbine generator. A switch gear 22 is illustrated in electrical communication with an output of the EER 20 via a line 24. Switch gear 22 provides electrical isolation between the electrical output of electricity source 18 and transmission section 14.

[0018] An output of switch gear 22 connects to a cutout 26 via a line 28. Cutout 26 is disposed within the transmission section 14 of the fracturing system 10, and is selectively opened to electrically isolate power generation section 12 from transmission section 14. An output end of cutout 26 connects to transmission lines 30₁₋₄, where transmission lines 30₁₋₄ define an example of a transmission line set 31. Transmission lines 30₁₋₄ transmit electricity from cutout 26 to another cutout 32, which is disposed proximate equipment load section 16. In one embodiment, one of the transmission lines 30₁₋₄ is a ground or neutral, while the remaining transmission lines 30₁₋₄ carry electricity that is at different phases. Transmission section 14 can be selectively isolated from equipment load section 16 by activating switching components in cutout 32. A switch gear 34 disposed in the equipment load section 16 electrically connects to cutout 32 via a line 36. Switch gear 34 provides electrical isolation between line 36 and equipment load 38. Equipment load 38, which connects to switch gear 34 through line 40, represents end users of

electricity generated by electricity source 18, and which as described in more detail below, pressurizes fluid that is used to fracture a subterranean formation.

[0019] In the illustrated example, power generation system 12 is located distal from equipment load section 16, and the transmission section 14 and transmission lines 30_{1,4} necessarily span the distance between power generation system 12 and equipment load section 16. Example distances between power generation system 12 and equipment load section 16 include up to about one mile, up to about five miles, up to about 20 miles, up to about 50 miles, up to about 100 miles, up to about 300 miles, up to about all distances between the cited distances, and about one mile, five miles, 20 miles, 50 miles, 100 miles, 300 miles, and all distances there between. For the purposes of discussion herein, a long distance between a power generation system 12 and equipment load section 16 is at least one half of a mile. Advantages of a transmission section 14 that extends long distances, include that the fracturing system 10 disclosed herein can operate at a designated operation performance and overcome physical conditions that are present at a fracturing site. Such physical conditions include insufficient available space proximate a well site that is being fractured to accommodate both the equipment load section 16 and power generation section 12. Other restrictions may prevent the power generation system 12 from being situated with or proximate to the equipment load section 16, such as noise and emissions restrictions local to an area being fractured (*i.e.* wildlife preserves, residential neighborhoods, airports). Thus the power generation section 12 can be set a long distance from the equipment load section 16, and yet still provide ample electricity to operate the equipment load section 16 to a designated performance level. Alternatively, the power generation section 12 can be selectively connected to, and power, multiple different equipment load sections 16 that are disposed distal from the power generation section 12.

[0020] Referring now to Figure 2, an example of a turbine 44 is schematically illustrated, and which receives a combustible fuel from a fuel source 46 via a feed line 48. In one example, the combustible fuel is natural gas, and the fuel source 46 can be a container of natural gas or a well (not shown) proximate the turbine 44. Combustion of the fuel in the turbine 44 in turn powers a generator 50 that produces electricity. Shaft 52 connects generator 50 to turbine 44. Optionally, other types of couplings, such as gearing, can be used to connecting generator 50 to turbine 44. The combination of the turbine 44, generator 50, line 24, and shaft 52 define one example of electricity source 18.

[0021] Shown in schematic form in Figure 3 is one example of the equipment load 38A of the hydraulic fracturing system 10 (Figure 1), and that is used for pressurizing a wellbore 60 to create fractures 62 in a subterranean formation 64 that surrounds the wellbore 60. Included with the equipment load 38A is a hydration unit 66 that receives fluid from a fluid source 68 via line 70, and also selectively receives additives from an additive source 72 via line 74. Additive source 72 can be separate from the hydration unit 66 as a stand-alone unit, or can be included as part of the same unit as the hydration unit 66. The fluid, which in one example is water, is mixed inside of the hydration unit 66 with the additives. In an embodiment, the fluid and additives are mixed over a period of time to allow for uniform distribution of the additives within the fluid. In the example of Figure 2, the fluid and additive mixture is transferred to a blender 76 via line 78. A proppant source 80 contains proppant, which is delivered to the blender 76 as represented by line 82, where in one example, line 82 is a conveyer. Inside the blender 76, the proppant and fluid/additive mixture are combined to form a fracturing slurry, which is then transferred to a fracturing pump 84 via line 86; thus fluid in line 86 includes the discharge of blender unit 76 which is the suction (or boost) for the fracturing pump system 84. Blender 76 can have an

onboard chemical additive system, such as with chemical pumps and augers. Optionally, additive source 72 can provide chemicals to blender 76; or a separate and standalone chemical additive system (not shown) can be provided for delivering chemicals to the blender 76. In an example, the pressure of the slurry in line 86 ranges from around 80 psi to around 100 psi. The pressure of the slurry in line 94 can be increased up to around 15,000 psi by pump 84. A motor 88, which connects to pump 84 via connection 90, drives pump 84 so that it can pressurize the slurry. In one example, the connection 90 is a direct coupling between an electric motor 88 and a hydraulic fracturing pump 84. In another example, the connection 90 is more than one direct coupling, but includes one on each end of the motor and two hydraulic fracturing pumps (not shown).

[0022] In an alternative, each hydraulic fracturing pump 84 is decoupled independently from the main electric motor 88. In one example, the motor 88 is controlled by a variable frequency drive (“VFD”) 91. After being discharged from pump 84, slurry is injected into a wellhead assembly 92; discharge piping 94 connects discharge of pump 84 with wellhead assembly 92 and provides a conduit for the slurry between the pump 84 and the wellhead assembly 92. In an alternative, hoses or other connections can be used to provide a conduit for the slurry between the pump 84 and the wellhead assembly 92. Optionally, any type of fluid can be pressurized by the fracturing pump 84 to form a fracturing fluid that is then pumped into the wellbore 60 for fracturing the formation 64, and is not limited to fluids having chemicals or proppant. Examples also exist wherein the system 38A includes the ability to pump down equipment, instrumentation, or other retrievable items through the slurry into the wellbore.

[0023] Still referring to Figure 3, an end of line 40 opposite from switch gear 34 (Figure 1) is shown connecting to and in electrical communication with a power bus 96. Lines 98, 100, 102,

104, 106, and 108 are depicted connected to power bus 96, and which transmit electricity to electrically powered end users in the equipment load 38. More specifically, line 98 connects fluid source 68 to bus 96, line 100 connects additive source 72 to bus 96, line 102 connects hydration unit 66 to bus 96, line 104 connects proppant source 80 to bus 96, line 106 connects blender 76 to bus 96, and line 108 connects motor 88 to bus 96. In an embodiment, lines 24, 40, 98, 100, 102, 104, 106, 108, power bus 96, and transmission section 14 define a micro grid 109. In an example, additive source 72 contains ten or more chemical pumps for supplementing the existing chemical pumps on the hydration unit 66 and blender 76. Chemicals from the additive source 72 can be delivered via lines 74 to either the hydration unit 66 and/or the blender 76.

[0024] Depicted schematically in Figure 4 is an alternate example of a fracturing system 10A having a power generation section 12A that includes multiple turbine generators $18A_{1-4}$, and multiple EERs $20A_{1, 2}$. In this example EER $20A_1$ is associated with and controls turbine generators $18A_{1, 2}$; and EER $20A_2$ is associated with and controls turbine generators $18A_{3, 4}$. Alternatively, an EER could be provided for each turbine generator so that every turbine generator has a dedicated EER. Electricity generated by turbine generators $18A_{1, 2}$ is transmitted to switch gear $22A_1$, and electricity generated by turbine generators $18A_{3, 4}$ is transmitted to switch gear $22A_2$. Output from switch gears $22A_{1, 2}$ is transmitted to switch gear $22A_3$, where switch gear $22A_{1-3}$ are all disposed within power generation section 12A. In the example of Figure 4, a transformer 110A is shown between in transmission section 14A and connected to an output of switch gear $22A_3$ by line 28A. In an example, transformer 110A is a step up transformer that increases voltage of the electricity being supplied by the power generation section 12A and to reduce electrical losses across the long distances of the transmission section 14A. Example voltages of the electricity being generated by electricity source 18, $18A_{1-4}$ range

from around 4,160 V to around 13,800 V. In one embodiment, transformer 110A steps up the voltage of the electricity up to around 50,000 V, which includes any value between 50,000 V and the voltage of the electricity received by transformer 110A. A transformer 112A is shown disposed at an end of transmission section 14A and proximate to equipment load section 16A. In one embodiment, transformer 112A is a step down transformer and reduces the voltage of the electricity being transmitted across transmission section 14A. Examples exist where the transformer 112A reduces voltage of the electricity to around 13,800 V, 4160 V, to around 600 V, to around 480 V, other voltages, or to voltages as needed by equipment in the equipment load section 16A.

[0025] Still referring to Figure 4, switch gear 34A₁ in the equipment load section 16A receives, via line 36A, electricity conditioned by transformer 112A. Electricity from switch gear 34A₁ flows to switch gear 34A₂ and in parallel to switch gear 34A₃. Electricity from switch gear 34A₂ feeds equipment loads 38A₁₋₅, and electricity from switch gear 34A₃ feeds equipment loads 38A₆₋₁₀, where equipment loads 38A₁₋₁₀, can be the same or similar equipment illustrated in Figure 3 used for pressurizing hydraulic fluid and that are electrically powered. Optional transformers 114A₁₋₁₀ are shown that step down voltages of electricity being delivered respectively to equipment loads 38A₁₋₁₀. For the sake of brevity not all combinations of the fracturing system 10 are illustrated in the accompanying figures, but many more combinations do exist and are considered within the scope of the present disclosure. In alternate examples, the number of turbine generators 18 can range from one to six or more and any number between, the number of EERs 20 can range from one to six or more, and any number between, the transmission line sets 31 can range from one to six or more, and any number between. Further optionally, the number of switch gear in the power generation section 12 and in the equipment

load section 16 can range from zero to four or more, and any number between. Also, when more than one switch gear is disposed in a one of the sections 12, 16, different tie in arrangements are possible. For example, each switch gear can directly connect to equipment in the particular section 12, 16 and be in parallel, or can connect to one another in series. Additionally, examples exist where cutouts 26, 32 are provided at opposing ends of a transmission section 14.

[0026] Provided in schematic form in Figure 5 is an example of a hydraulic fracturing system 10B having multiple equipment load sections 16B_{1-n}. In this example, power generation section 12B is distal from each of the equipment load sections 16B_{1-n} by at least a long distance. As illustrated, transmission section 14B provides electrical communication between power generation section 12B and equipment load section 16B₁. However, the transmission section 14B is readily moveable, so that power from power generation section 12B via transmission section 14B can be readily switched from equipment load section 16B₁ to another one of the equipment load sections 16B_{2-n}. The switching process can be repeated until all equipment load sections 16B_{1-n} are in electrical communication with and powered by power generation section 12B. An example of switching communication to another one of the equipment load sections 16B_{1-n} can be when fracturing operations are completed or ceased at a one of the equipment load sections 16B_{1-n}. Although all sections of all embodiments of the hydraulic fracturing system 10 are readily mobile, in some applications an advantage exists by reconfiguring/moving the transmission section 14B rather than the power generation system 12B when providing electrical power to the equipment load sections 16B_{1-n} that are disposed at different locations.

[0027] The present invention described herein, therefore, is well adapted to carry out the objects and attain the ends and advantages mentioned, as well as others inherent therein. While a presently preferred embodiment of the invention has been given for purposes of disclosure,

numerous changes exist in the details of procedures for accomplishing the desired results. These and other similar modifications will readily suggest themselves to those skilled in the art, and are intended to be encompassed within the scope of the present invention defined by the appended claims.

CLAIMS

1. A hydraulic fracturing system for fracturing a subterranean formation comprising:

an electric motor;

a pump coupled to the motor, and that has a discharge in fluid communication with a wellbore that intersects the formation, so that when the motor is activated and drives the pump, pressurized fluid from the pump pressurizes the wellbore to fracture the formation;

a variable frequency drive in communication with the electric motor, and that controls the speed of the motor, and performs electric motor diagnostics to prevent damage to the electric motor;

a source of electricity in electrical communication with the electric motor;

transmission lines that connect the source of electricity to the electric motor and that span a distance between the source of electricity and the electric motor; and

a switch gear between the transmission line and the source of electricity, and another switch gear between the transmission line and the electric motor.

2. The hydraulic fracturing system of Claim 1, further comprising a transformer between the transmission line and the source of electricity.

3. The hydraulic fracturing system of Claim 1, further comprising a transformer between the transmission line and the electric motor.

4. The hydraulic fracturing system of Claim 1, wherein the source of electricity is selected from the group consisting of a utility outlet, a turbine generator, and a reciprocating engine generator.

5. The hydraulic fracturing system of Claim 4, further comprising an electric equipment room in communication with the turbine generator and which controls operation of the turbine generator.

6. The hydraulic fracturing system of Claim 1, further comprising a transformer between the switch gear and the electric motor.

7. The hydraulic fracturing system of Claim 1, wherein the electric motor comprises a first electric motor, the system further comprising a multiplicity of electric motors, and wherein the transmission lines are selectively moveable at different times to provide electrical communication between the source of electricity and the multiplicity of motors.

8. A hydraulic fracturing system for fracturing a subterranean formation comprising:

a power generation section;

an equipment load section that is in communication with the power generation section, and that comprises,

an electric motor, and

a pump driven by the electric motor and that has a discharge in communication with a wellbore that intersects the formation; and

a transmission section that extends between the power generation section and the equipment load section, and through which the power generation section and equipment load section are in electrical communication, and that comprises,

a set of transmission lines, wherein a one of the lines is a neutral line, and wherein electricity at different phases is transmitted along the other lines; and

a switch gear between the transmission section and the power generation section, and another switch gear between the transmission section and the electric motor.

9. The hydraulic fracturing system of Claim 8, further comprising a variable frequency drive in communication with the electric motor, and that controls the speed of the motor, and performs electric motor diagnostics to prevent damage to the electric motor.

10. The hydraulic fracturing system of Claim 8, further comprising lines that provide electrical communication from the transmission section to electrically powered equipment disposed in the equipment load section, and wherein the lines comprise a micro grid.

11. The hydraulic fracturing system of Claim 8, wherein the power generation section comprises a turbine that is powered by natural gas and that is coupled to a generator.

12. A method of fracturing a subterranean formation comprising:

driving a pump with an electrical motor;

transmitting electricity to the electrical motor from a power source that is in electrical communication with the electrical motor, wherein a first switch gear is positioned between the power source and the transmission line and a second switch gear is positioned between the transmission line and the electric motor;

pressurizing a fluid with the pump to form a pressurized fluid; and

fracturing the subterranean formation by directing the pressurized fluid to a wellbore that intersects the subterranean formation.

13. The method of Claim 12, further comprising controlling a speed of the motor with a variable frequency drive.

14. The method of Claim 13, further comprising performing diagnostics on the electric motor with the variable frequency drive.

15. The method of Claim 12, further comprising increasing a voltage of the electricity proximate the power source with a transformer, and decreasing the voltage of the electricity proximate the electric motor.

16. The method of Claim 12, further comprising suspending electrical communication between the power source and the electrical motor with one of a cutout or a switch gear.

17. The method of Claim 12, wherein the electrical motor comprises a first electrical motor, the pump comprises a first pump, the wellbore comprises a first wellbore, and the subterranean

formation comprises a first subterranean formation, and wherein the step of transmitting electricity to the electrical motor comprises transmitting electricity across a transmission section that has an end in electrical communication with the power source, and another end that is in electrical communication with the first electrical motor, the method further comprising,

disconnecting the end of the transmission section that is in communication with the first electrical motor and reconnecting that end to a second electrical motor in communication with the power supply and that is connected to a second pump, and

pressurizing fluid with the second pump and directing the pressurized fluid to a second wellbore for fracturing a second subterranean formation.

18. The method of Claim 12, wherein the power source comprises a power generation section that includes devices selected from the group consisting of a utility outlet, a turbine generator, and an electrical equipment room.

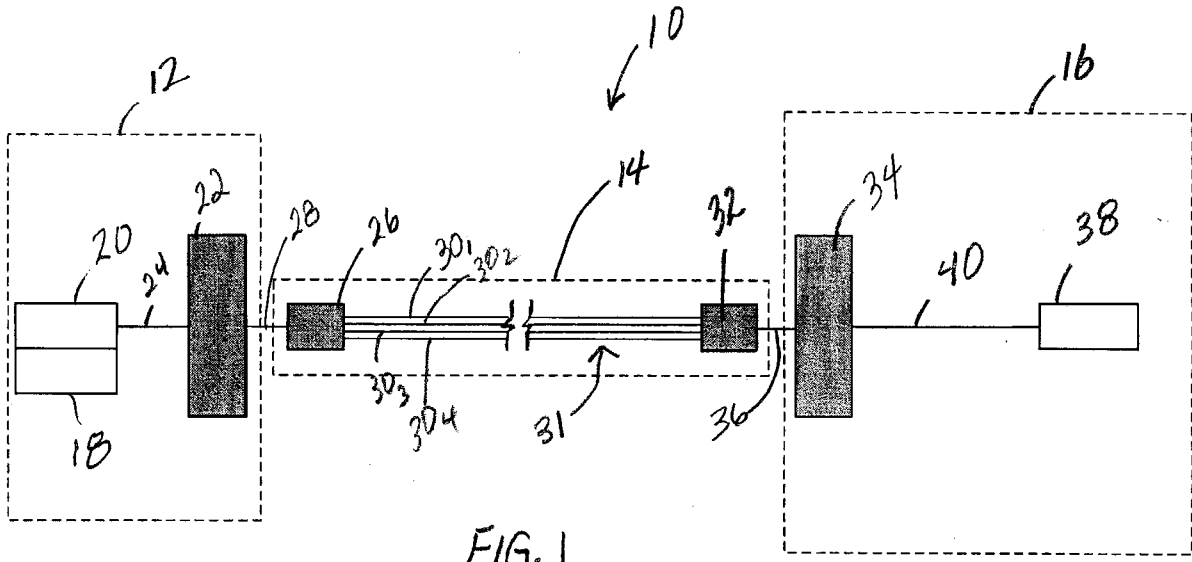


FIG. 1

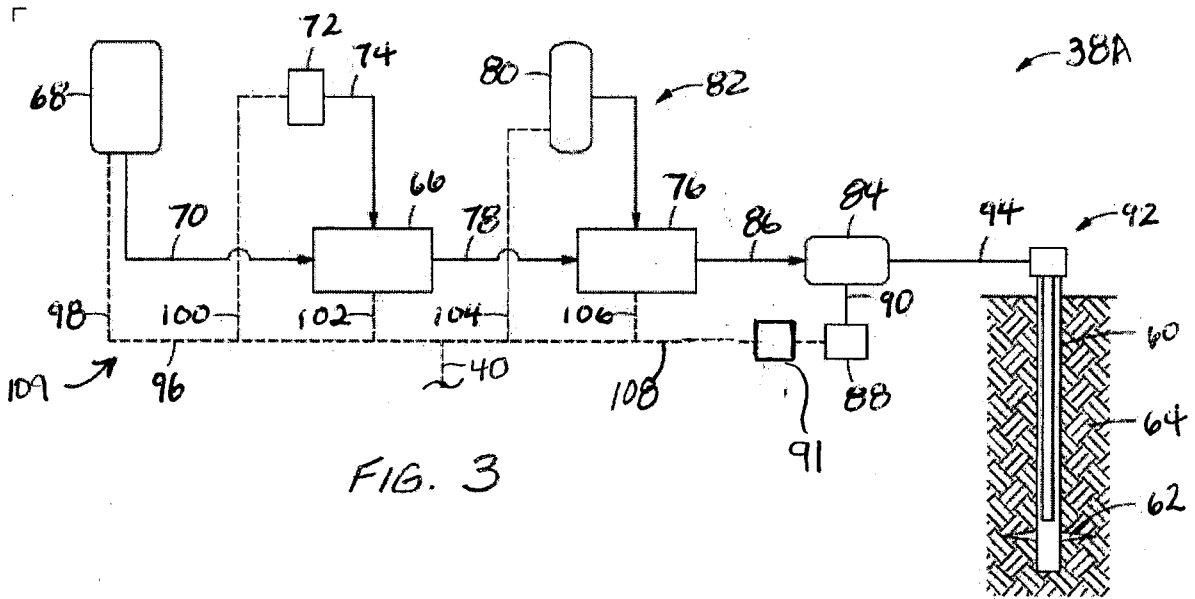


FIG. 3

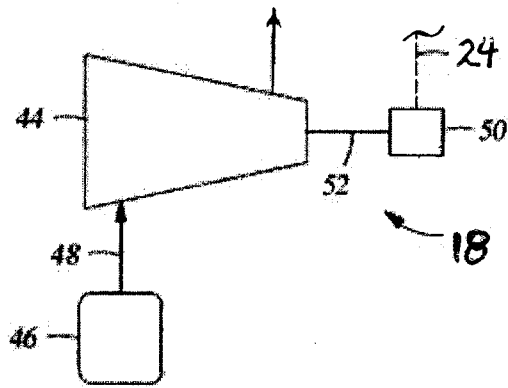


FIG. 2

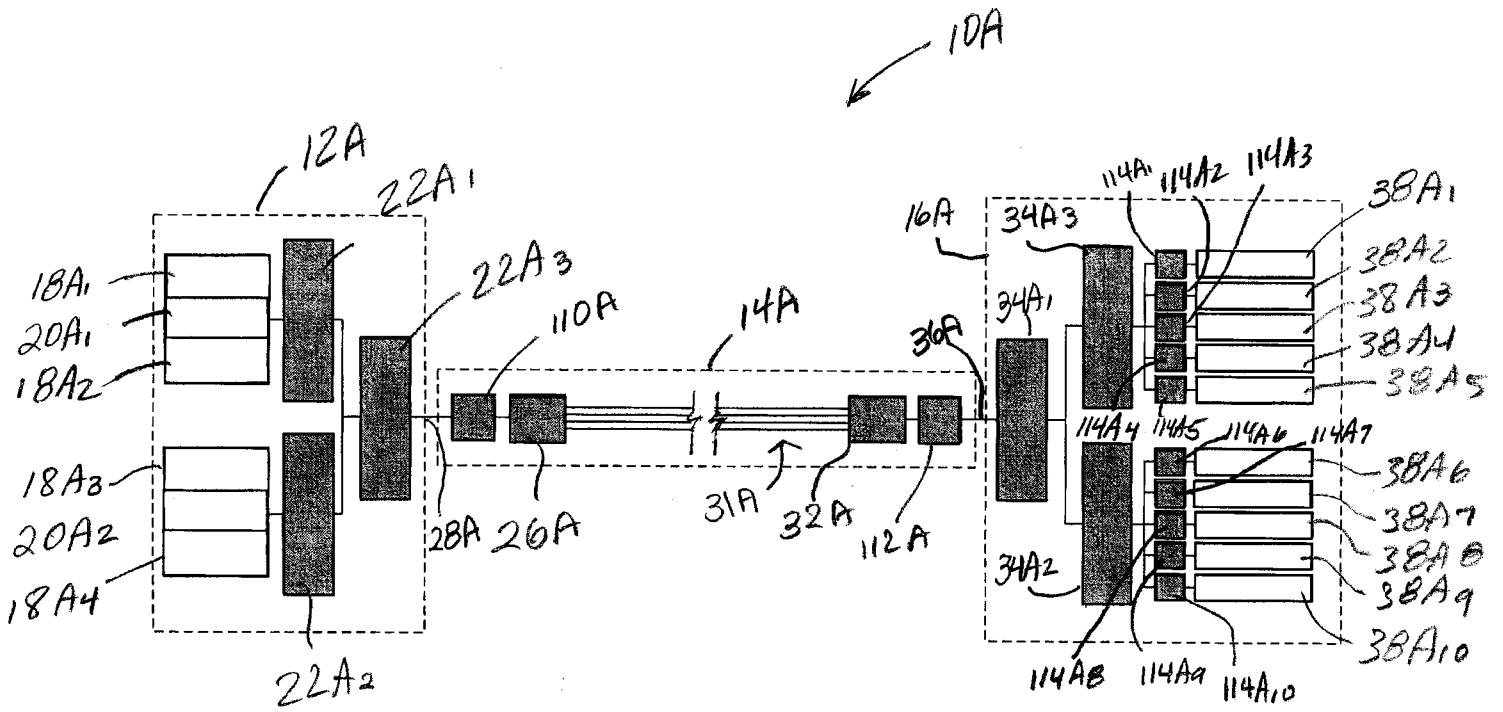


FIG. 4

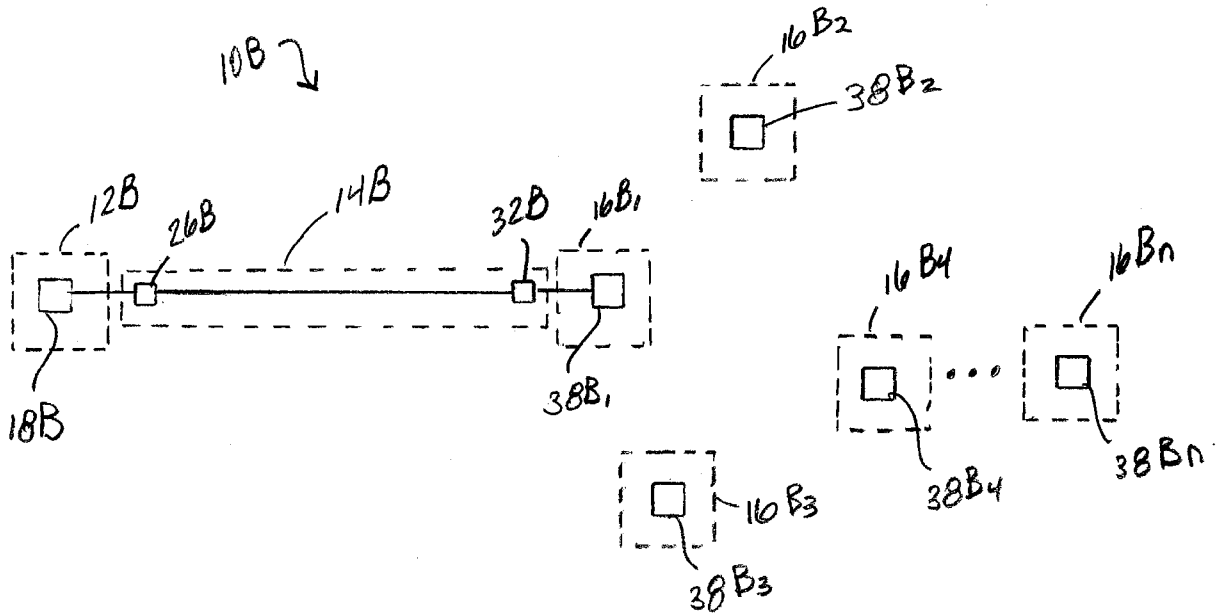


FIG. 5

