The purpose of this invention is to improve on the safety and to allow more efficient production of subterranean formation during fracturing operations with a reduced down-time, minimal supervision and maintenance expense by utilizing remotely operated ground valves having metal-to-metal, gate and seat seal design operable to maintain a dual sided flow and pressure control. Use of a new 45-degree flow-1 connector of a Zipper Manifold in combination with the system described is particularly useful for reducing erosion with proppant-laden fracturing fluid.
DISPOSING AT LEAST 3 GROUND VALVES WITHIN A FLOW LINES BETWEEN THE SOURCE OF PRESSURIZED FLUID AND THE WELL HEAD

CONNECTING AT LEAST 3 GROUND VALVES THROUGH INLET/OUTLET WITH A HIGH PRESSURE HOSES

CONNECTING HIGH PRESSURE HOSES WITH AN ACCUMULATOR

PLACING AN ACCUMULATOR'S CONTROL IN AN OPEN POSITION

PLACING ACCUMULATOR'S CONTROLS IN A CLOSE POSITION

FIG. 5
REMOTE OPERATED SYSTEM FOR USE IN HYDRAULIC FRACTURING OF GROUND FORMATIONS, AND METHOD OF USING SAME

CROSS-REFERENCE TO RELATED APPLICATIONS


TECHNICAL FIELD

[0002] A remotely operated system for the purpose of safely and cost-effectively conducting hydraulic fracturing of ground formations and method of using same is disclosed. In particular, a system and method utilizing a remotely operated system of ground valves disposed between fracturing equipment and a well bore, is set forth.

BACKGROUND OF THE INVENTION

[0003] Induced hydraulic fracturing, commonly known as fracking is a technique used to release petroleum, natural gas, or other substances for extraction by utilizing pressurized fluid such as water, brine, foam or the like which fluid breaks or fractures the oil or gas producing strata down the well. Although hydraulic fracturing operations take a relatively short amount of time to complete, the process may be repeated multiple times in “stages” to reach maximum areas of the wellbore. When this is done, the wellbore is temporarily plugged between each stage to maintain the highest pressure possible to get the maximum fracturing result.

[0004] During the fracturing process, pressurized fluid also called a fracturing slurry is often introduced in excess of 7,500 psi in order to cause the rock formations down the well to fracture. Pressures of the magnitude found in hydraulic fracturing processes can usually be tolerated by the well tubing or casing, which extends downward from ground level into the wall. However, the valves which are placed at the well head to form a well tree (Christmas Tree) are often not capable of containing such pressures, which may cause a blow-up or rupture of the well head, severe damage to the well itself and the fracturing equipment placed nearby.

[0005] In an effort to contain damage to the fracturing equipment (being a source of pressurized fluid) in a blow-up condition, in addition to high-pressure valves usually disposed over the Christmas Tree, operators of the hydraulic fracturing equipment utilize manually operated ground valves disposed within the flow lines, which connect the fracturing equipment (e.g. fracturing manifold) with the well head. The valves are manually operated plug and/or block style ground/gate valves also known as fracturing relay valves or fracturing control valves; their primary function is to control the flow of the pressurized fluid pumped by the fracturing pumps to the well casing. Such valves are designed to operate as one-way valves, passing the pressurized fluid from the higher pressure area to the lower pressure area. Between each stage being completed during the fracturing operation, the valves are manually operated (closed) to prevent further flow of the pressurized fluid while the wellbore is temporarily plugged for future production.

[0006] The manually operated ground valves, however, have proven unsafe and inefficient for the reasons explained below. First, in a blow-up of the well, the manually controlled valves are in a “Danger Zone,” an area of high probability of injury occurring due to the flying debris from the dismantling well. If the field personnel are caught around the valves while attempting to manually stop the flow of the fracturing slurry between the stages of the fracturing operation, that person inevitably is exposed to a grave injury. If the person is outside the Danger Zone at the time of ensuing blow-up, it will not be safe to walk up to the ground valves to manually turn the handwheel of the valve in order to prevent further damage to the fracturing equipment. Severe injuries and fatalities are not uncommon when manually operated ground valves are utilized.

[0007] The fluids introduced into the well are not only highly pressurized but are generally corrosive and abrasive because they are frequently laden with corrosive acids and abrasive propellants such as sand, shale, coal or the like. In addition to dangers related to manually controlled ground valves, the presently used in the industry ground valves suffer from a number of significant disadvantages due to the known condition called “bleeding back” during which the pressurized fracturing slurry backs up to the fracturing equipment and causes the ground valves to be exposed to the abrasive fluid.

[0008] Traditionally utilized plug and/or block valves are one-way valves, having Teflon ball and seat design of the seal, which does not completely seal the cavity of the valve’s body causing the valve to relatively quickly pack full with sand and debris (wash out), and become extremely difficult, if not impossible to operate due to buckling up during normal fracturing. This makes the valve impossible to turn. When in a fully open position, the plug and/or block style valves are not capable of securing a tight seal between the Teflon ball and the seat causing the abrasive and pressurized fluid, sand and other undesirable debris to freely enter the cavity of the valve’s body during bleeding back, making the valve eventually inoperable and necessary to replace.

[0009] Further, a flow-T connector of a Zipper Manifold for selectively servicing two or more wells typically disposed between a source of pressurized fluid and the well head, receives the fracturing slurry at 90 degree angle, causing further damage to the ground valves positioned in such outlet of the flow-T connector for selectively isolating the fracturing slurry, and the damage to downstream components.

[0010] Manually controlled plug and/or block type ground valves operating life time is approximately 60 to 70 operational hours, or an average of only 35 to 40 stages of fracturing operation before incurring downtime and loss of productivity. In addition to an unscheduled stoppage of fracturing operation, the replacement becomes cost-prohibitive, if the valves have to be replaced more frequently than their normal operable life time.

[0011] With the use of manually operated ground valves, the breaks between each stage of fracturing operation are further augmented due to the loss of fracturing pumps “prime.” The fracturing pumps utilized in the industry are of pressurized operational design. If the pumps are not pumping fluid with an applied pressure to do so, they lose their prime and will become desynchronized with one another, rendering the pump inoperable and, ultimately, unable to pump. The
loss of the pump prime occurs during the fracturing process after each and every stage, while transitioning/shutting down pumps using manually operated ground valves in order to begin the wire line operations. [0012] Downtime related to the breaks taken between the fracturing stages to open or close the manually controlled ground valves aggregate to an average of approximately 45 minutes every 2-2½ hours of uninterrupted operation of each fracturing stage. Overall, during the 24 hour period of fracturing operation, the down time related to the breaks in stages totals approximately 5 to 6 hours of stoppage where no production activity takes place. [0013] Accordingly, there is a need for safer and cost-effective fracturing system and method that does not use manually operated plug and/or block type valves. There is also a need for a fracturing method that does not create life threatening conditions and cause injuries to field personnel related to operation of manual ground valves. There is also further need for fracturing method that increases productivity of the well by avoiding the downtime caused by unnecessary repairs and/or replacement of the manually operated valves. It is a further object of the invention to provide such a system which can be disassembled for carrying from place to place, and which can be assembled relatively easily on the site. Thus, there is a need for a remotely operated system and method, which is safer to operate, prolong the average of operational hours for said system and brings the well to a faster and continued production.

SUMMARY OF THE INVENTION

[0014] The embodiments of the present disclosure alleviate to a great extent the disadvantages of using manually operated ground valves disposed within the flow lines, connecting fracturing equipment and the well bore by providing a remotely controlled ground valves which are actuated by an accumulator positioned outside the Danger Zone, thus enhancing the safety and eliminating the down time related to fracturing stages.

[0015] A remotely controlled system operated outside the Danger Zone and method disclosed herein is a field tested system and method that replaces the traditional manually operated, plug and/or block type ground valves currently used throughout the fracturing industry. The remote operation of the ground valves eliminates injury to the field personnel.

[0016] A remotely controlled ground valve system being disposed within the flow lines, connecting the fracturing equipment (being a source of pressurized fluid) and the well head includes at least three (3) ground valves, having preferably metal-to-metal, gate and seat seal design for securing adequate seal in an open position, having dual-sided-flow and capability of containing a dual sided pressure from both ports of entry. The at least three (3) ground valves are connected through the inlet and outlet line of each valve, respectively, with one or more high pressure hose(s) and actuated by an accumulator being powered by any means of energy source such as electrical, diesel, pneumatic or hydraulic, wind, or any other available energy source. The accumulator is positioned outside the Danger Zone, which in relation to the remotely controlled valves is approximately up to 150 feet from the closest of the ground valves and up to 200 feet from the furthest of the ground valves.

[0017] The utilization of the system (as tested in the field) increases the operational duration of the remotely controlled ground valves from approximately 60-70 operational hours, which equates to approximately 40-45 stages of fracturing operation to approximately 5,300 hours, which translates to an average of over 3,500 completed stages without a moment of downtime.

[0018] According to one embodiment of the present disclosure, the system includes one or more high pressure hose(s) which deliver pressured substances to actuate the ground valves. In preferred embodiment of the present disclosure, each valve is operated separately. For instance, a first valve in the system may be actuated by the accumulator and opened, while a second and third valve may be actuated to a position of closed. Such independent control provided to the ground valves by the accumulator’s controls allows continued fracturing as long as at least one valve is fully operational capable to be fully opened or fully closed). Yet, in another embodiment, the ground valves can be actuated in-syndec and, thus, opened/closed simultaneously.

[0019] Yet, another advantage of the present invention is that the accumulator’s controls may be operated manually or may be programmed to operate and function automatically from a control office or anywhere in the field by reversibly remotely actuated a transmitter/receiver set of the type commonly used for opening and closing garage doors from a hand held unit.

[0020] According to one embodiment of the present disclosure, the system comprises a Zipper Manifold for selectively servicing two or more wells, said Zipper Manifold connecting the fracturing equipment with each of the servicing well heads, wherein said Zipper Manifold comprises a flow-T connector, wherein the fracturing slurry reaches said flow-T connector at approximately 45 degree angle, thus reducing velocity of the slurry and an erosion of the valves positioned in each outlet of the flow-T connector and the downstream components, said system of valves comprising at least two (2) remotely operated ground valves disposed within the flow lines on both ends of the flow-T connector and at least two (2) remotely operated ground valves positioned downstream of the at least two (2) remotely operated ground valves.

[0021] According to one embodiment of the present disclosure, the remotely controlled at least two (2) ground valves of the Zipper Manifold may be operated by a separate accumulator unit or, by the same accumulator unit as the at least three (3) ground valves discussed above. If the at least two (2) remotely controlled valves are operated by the separate accumulator unit, said accumulator is preferably positioned outside the Danger Zone.

[0022] Exemplary embodiments further include a method of fracturing subterranean formations, comprising: disposing at least three (3) ground valves within a flow lines, wherein said flow lines connect a source of pressurized fluid (e.g. fracturing manifold) with the head of the well bore; connecting said at least three (3) ground valves through their respective inlet/outlet lines with one or more high pressure hose(s); connecting said high pressure hoses with an accumulator, wherein said accumulator is positioned in relation to said valves at approximately up to 150 feet from the closest and at approximately up to 200 feet from the furthest ground valve; placing the accumulator’s controls in an open position to remotely open said valves, wherein a fracturing slurry can pass freely through the flow lines; and after each stage of fracturing is completed, placing each said valve in a closed position.

[0023] Exemplary methods may further comprise placing of Zipper Manifold with a flow lines, said Zipper Manifold...
comprising: a flow-T connector, wherein a fracturing slurry is received at approximately 45 degree angle; at least two (2) remotely operated ground valves, wherein each valve is disposed on each end of the flow-T connector and wherein each valve is individually controlled by an accumulator’s controls, said accumulator placed outside the Danger Zone; and at least two (2) manually controlled ground valves, said valves disposed downstream of the remotely controlled at least two (2) ground valves of the Zipper Manifold.

[0024] According to one embodiment of the present disclosure, the system disclosed herein is externally oiled before the system is commissioned to maintain its longevity. It is also the object of the present invention to provide the system, wherein when interior parts have been compromised or damaged, the system is configured to still safely continue operations, allowing the user the flexibility and time required to safely and cost-effectively make alternative decisions and adjustments to the system.

[0025] Although this system has been developed to improve safety and effectiveness of the fracturing operation in an oil and gas wells, it may also find application in a programs for stimulating gas drainage from coal mines and in stimulating water wells for domestic, agricultural or industrial use or for other purposes when it is desirable to inject a particulate material with the fracturing fluid under relatively high pressure.

[0026] The principals of the invention will be further discussed with reference to the drawing(s) wherein a preferred embodiment is shown. The specifics illustrated in the drawings are intended to exemplify, rather than limit aspects of the invention as defined in the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027] For a more complete understanding, reference is now made to the following description taken in conjunction with the accompanying drawings in which:

[0028] FIG. 1 is a schematic representation of prior art solution depicting fracturing operation with the use of manually operated ground valves and the showing of an area depicting a Danger Zone during the fracturing operation.

[0029] FIG. 2A is a diagrammatic representation of a typical fracturing layout according to embodiments of the present disclosure.

[0030] FIG. 2B is a simplified diagrammatic representation of the Zipper Manifold according to embodiments of the present disclosure.

[0031] FIG. 3 is a detailed representation of the system of FIG. 2A according to embodiments of the present disclosure.

[0032] FIG. 4 depicts a typical ground valve according to one embodiment of the present disclosure.

[0033] FIG. 5 is a flow chart illustrating an exemplary method of conducting safe and cost-effective fracturing operation according to embodiments of the present disclosure.

DETAILED DESCRIPTION

[0034] Referring now to the drawings, wherein like reference numbers are used herein to designate like elements throughout, the various views and embodiments of a remotely operated system and method of using said for the purpose of safely and cost-effectively conducting fracturing of the subterranean formations are illustrated and described, and other possible embodiments are described. The figures are not necessarily drawn to scale, and in some instances the drawings have been exaggerated and/or simplified in places for illustrative purposes only. One of ordinary skill in the art will appreciate the many possible applications and variations based on the following examples of possible embodiments. As used herein, the “present disclosure” refers to any one of the embodiments described herein, and any equivalents. Furthermore, reference to various aspects of the disclosure throughout this document does not mean that all claimed embodiments or methods must include the referenced aspects.

[0035] FIG. 1 is a schematic representation of a fracturing operation layout often referred to as fracturing field known to a prior art. A typical fracturing field 10 utilizes a variety of equipment and comprises: a wellhead 20 connected through a flow lines 30 with a source of pressurized fluid comprising: a fracturing manifold 40, said fracturing manifold 40, connected to a fracturing pumps 50, said pumps receiving propellant (fracturing slurry consisting of water, sand, gel and other additives utilized in hydraulic operations) through a blader 60 being connected to a hydration unit 70, a chemical unit 80 and a sand storage tanks 90 and a fluid storage tank 100. Further in FIG. 1 are depicted at least three (3) ground valves 110 (4 shown in the drawings) also known in the fracturing industry as fracking relay valves, gate valves, or a flow control valves disposed within the flow lines 30, said valves controlling the flow of the fracturing slurry during each stage of the fracturing and being operated manually by the field personnel. As known in prior art, the at least three (3) ground valves 110 are disposed within the flow lines 30 and may be connected with a flow-T connector of the Zipper Manifold (not shown in the drawing), receiving the fracturing slurry through the flow lines 30 at the 90 degree angle.

[0036] FIG. 1 further shows an area 120 depicting a Danger Zone identified in a fracturing field. The Danger Zone 120 covers an area where injuries are likely to occur during the blow-up condition of the well head not being able to contain the pressure. The Danger Zone may be described as an area covering the entire location of the fracturing field and include all on-site associated areas in which fracturing operations are taking place, and having dimensions marked by the outline, and/or outermost boundaries of the equipment footprint designated to be either directly or indirectly involved with and associated with the fracturing process as per FIG. 1. Typically, an area commonly established on the fracturing well-site would be as follows: up to 100 feet radius from the actual well-head/well-bore and approximately 15 feet radius from all outer lying associated equipment. Personnel attempting to close or open the manual ground valves 110, may be stranded on the field, thus being exposed to injuries and even death by striking debris of a dismantling well bore’s components in a blow-up condition.

[0037] Furthermore, the manually controlled ground valves presently used in the industry are plug/block style, one-way valves. An inadequate Teflon ball and seat design of the seal, cause the valves to be frequently packed with sand, debris during the bleeding back of the fracturing slurry, causing substantial damage to the body of the valve’s cavity and necessitating frequent replacement.

[0038] By eliminating manual operation of the ground valves by the field personnel and, replacing them with a remotely operated metal-to-metal, gate and seat seal design, the danger of injuries and a loss of life on a fracturing field has been greatly eliminated.
[0039] Furthermore, by utilization of a ground valves having metal-to-metal, gate and seat seal design, a dual sided flow and pressure control is maintained throughout the entire fracturing operation. Since the fracturing operation is conducted in stages, the remotely controlled ground valves are operable to be almost instantly turned to close or open between the stages of each fracturing operation. Typically, with the manually controlled valves it takes approximately 45 minutes for the personnel to close (or open) the valves. This 45 minutes break does not take into account the situation where the valves are washed out and no longer operable, thus have to be replaced. There is a significant shortage of plug/block style valves, causing the breaks to be even longer before the new valve could arrive.

[0040] Turning now to FIGS. 2A and 2B, according to embodiments of the present disclosure, a system 200 is used in conjunction with fracturing operation 10 to safely and cost effectively conduct a fracturing of subterranean formation. As used herein, the system 200 comprises at least three (3) remotely controlled ground valves 210 (4 valves are shown in a drawing) disposed over the flow lines 30 and being actuated by an accumulator 220, said accumulator connected with said valves 210 through one or more high pressure hose(s) 230 pushing high pressure substance (e.g. liquid or gas) and operable to independently control each ground valve through the accumulator’s controllers (as shown in FIG. 3) designated for each ground valve.

[0041] FIG. 2B shows a simplified diagrammatic view of the general fracturing field 10 according to embodiments of the present disclosure depicting Zipper Manifold 260 for selectively servicing two or more wells, having a flow-T connector 240 designed to receive the fracturing slurry at approximately 45 degree angle, thus reducing velocity in the outlets, which reduces erosion to the system of valves and the downstream components, said system of valves comprising at least two (2) remotely operated ground valves 280 disposed on both ends of the flow-T connector 240 and at least two (2) manually operated ground valves 300 following downstream the at least two (2) remotely operated ground valves 280.

[0042] According to one embodiment of the present disclosure, the remotely operated at least two (2) ground valves 280 of the Zipper Manifold may be controlled by a separate accumulator unit 220, or by the same accumulator unit 220 as the at least three (3) ground valves 210 (FIG. 2A) discussed above (not shown in FIG. 2B). If the at least two (2) remotely controlled valves 280 are operated by the separate (from the accumulator operating valves 210, FIG. 2A) accumulator unit 220, said accumulator is preferably positioned outside the Danger Zone 120 (FIG. 1). This variation in embodiments of the present disclosure will become apparent to those skilled in the art upon further examination of the drawings, or may be learned by practice of the invention.

[0043] FIG. 3 is a detailed representation of system 200 in FIG. 2A according to one embodiment of the present disclosure. In FIG. 3, at least three (3) (4 valves shown 12'-18') ground/gate valves, ranging from 5,000 to 20,000 psi working pressure capabilities may be utilized. The exemplary ground valve 12' is shown in FIG. 4 and may be of any commercially available brand or make. The recommended ground valves to practice the invention are a hydraulic gate valves of Cameron FC, FETE, EE trim as depicted in FIG. 4. The ground valves 12' through 18' are disposed within the flow lines 30 (FIG. 3), said flow lines 30 connecting fracturing manifold 40 with a goat head 22 directly seating on the Christmas Tree of the well head 20 (FIG. 1). Exemplary flow lines may be 3" or 4" 1502 flow iron line. Exemplary ground valves 12' through 18' shown in FIG. 3 are independently actuated (controlled) through an accumulator’s controls 12 through 18. The independent control of every ground valve through an accumulator’s controls, allows for continued fracturing operation as long as at least one ground valve of the system is fully operational (capable of being fully closed and fully opened).

[0044] According to one embodiment of the present disclosure, the ground valves may have their usual manual actuator (such as handwheels or lever on its stem) supplemented by the hydraulic accumulator capable of actuating the ground valves, said hydraulic accumulator powered by any available energy source.

[0045] Suitable accumulator 220 (FIG. 3) utilized to operate remotely the ground valves 12'-18' may be 4-station with 4 pressure bottles, diesel, pneumatic, hydraulic or electric. As an example, a 4 station hydraulic accumulator withstands at least 3500 psi of Meyer brand may be used. In accordance with one embodiment of the present disclosure, said accumulator 220, having 4 accumulator’s controls (stations), 12-18 (FIG. 3), each station operable independently to actuate at least three (3) ground valves (4 valves shown in FIG. 3) 12' through 18', respectively. The accumulator 220 is configured to remotely control said ground valves, 12' through 18' and is positioned outside the Danger Zone 120 as illustrated in FIG. 1.

[0046] In different embodiments, the components of system 200 of FIG. 2A and the Zipper Manifold 260 in FIG. 2B may be combined together (not shown in the drawings) such that the at least three (3) remotely controlled ground valves 210 may be disposed within the flow lines 30 between a source of pressurized fracturing fluid (e.g. fracturing manifold) and the Zipper Manifold 260 (FIG. 2B), said at least three (3) ground valves 210 and at least two (2) ground valves 280 of the Zipper Manifold 260 controlled by different accumulator units, said units positioned outside the Danger Zone. In other variations, if combined with the Zipper Manifold 260, the ground valves 210 of system 200 (FIG. 2A), may be disposed within the flow lines 30 and controlled by the same accumulator unit as the at least two (2) remotely operated valves 280 of the Zipper Manifold 260 (FIG. 2B), said accumulator unit positioned outside the Danger Zone.

[0047] FIG. 4 illustrates an exemplary valve 12' according to one embodiment of the present disclosure. An inlet 410 and outlet 420 lines allow the high pressured substance (e.g. fluid or gas) to control closing or opening of the valves, the exemplary valve 12' having: a hydraulic cylinder 430, a hydraulic piston 440, a .70 dura o' rings 450, a hydraulic stem 460, a body bushing and seat 470, a seat/gate guide 480, a bonnet seal ring 500, a type "U" packing 510, a metal to metal seal gate 520, a packing retainer nut 530, a tail/balance stem 540, and a tail stem housing 550.

[0048] According to embodiments of the present disclosure, the accumulator is removed from the Danger Zone and placed in relation to the ground valves of system 200 (FIG. 2A) at the distance of approximately up to 150 feet from the closest ground valve 16' disposed within the flow line 30 (FIG. 3) and as far as approximately up to 200 feet from the furthest ground valve 14' disposed within the flow line 30 (FIG. 3). A remotely positioned accumulator 220 eliminates the need of a field personnel directly operating ground valves 12' through 18' (FIG. 3) and at the same time eliminates any proximity of the personnel to the Danger Zone. The accumu-
lator may be operated through a manually controlled system of the accumulator’s controls 12 through 18, or the accumulator’s controls may be actuated by a transmitter/receiver set of the type commonly used for opening and closing garage doors from a small unit such as may be hand held (not shown on the drawings).

According to one embodiment of the present disclosure, the system utilizes one or more high pressure hose(s) 230 (FIG. 3) of the length up to 200 ft and \( \frac{1}{2} \)" to 2" in diameter and of at least 6,000 psi pressure capabilities. Said high pressure hoses 230 may be hydraulic or pneumatic and connect the ground valves 12’ through 18’ with the accumulator 220, said ground valves 12-18’ being remotely opened or closed through the move of a high pressure substance (e.g., fluid or gas), said move of the high pressure substance controlled by said accumulator 220.

Referring now to FIG. 5, there is illustrated a simplified diagrammatic view of the process flow 500 using system 200 as detailed in FIG. 3, wherein, comprising: disposing at least three (3) ground valves within a flow line, said flow line connecting a source of pressurized fluid with a well head Block 502; connecting said the at least 3 ground valves through said valves’ inlet and outlet line with one or more high pressure hose(s) Block 504; connecting said one or more high pressure hose(s) with an accumulator; said accumulator having at least three (3) accumulator’s controls, wherein said accumulator is positioned in relation to the at least three (3) ground valves at approximately up to 150 feet from the closest of said valves and at approximately up to 200 feet from the furthest of said ground valves Block 506; before directing a fracturing slurry from a source of pressurized fluid (e.g. fracturing manifold) through a flow line, placing said accumulator’s controls in an open position to remotely open each of the at least three (3) ground valves to allow said fracturing slurry to pass through each of the opened ground valve Block 508; after each fracturing stage is completed, placing said accumulator’s controls for each said ground valve in a close position to stop the flow of the fracturing slurry Block 510.

It should be understood that the drawings and detailed description herein are to be regarded in an illustrative rather than a restrictive manner, and are not intended to be limiting to the particular forms and examples disclosed. On the contrary, included are any further modifications, changes, rearrangements, substitutions, alternatives, design choices, and embodiments apparent to those of ordinary skill in the art, without departing from the spirit and scope hereof, as defined by the following claims. Thus, it is intended that the following claims be interpreted to embrace all such further modifications, changes, rearrangements, substitutions, alternatives, design choices, and embodiments.

What is claimed is:

1. A remotely operated system for use in hydraulic fracturing of ground formations, said remotely operated system comprising:
   an accumulator, said accumulator having at least three accumulator’s controls, wherein said accumulator is positioned outside a Danger Zone of a fracturing field;
   one or more high pressure hose(s) from said accumulator for flow of a pressurized substance to at least three ground valves;
   the at least three ground valves, each said valve disposed within a flow line connecting a source of pressurized fracturing fluid with a well head, wherein each said valve is operable remotely by said accumulator’s controls, said accumulator’s controls configured to activate to a closed or an open position each of the at least three ground valves independently of each other through said one or more high pressure hose(s).

2. The system of claim 1, wherein said accumulator may be a hydraulic accumulator and powered by any means of energy source.

3. The system of claim 1, wherein said accumulator may be positioned in relation to said at least three ground valves at approximately up to 150 feet from the closest of the at least three ground valves and at approximately up to 200 feet from the furthest of the at least three ground valves.

4. The system of claim 1, wherein the one or more high pressure hose(s) may be a hydraulic or a pneumatic pressure hose.

5. The system of claim 1 further comprising:
   a flow-T connector, said flow-T connector designed to receive a fracturing slurry at approximately 45 degree angle.

6. The system of claim 1, wherein the at least three ground valves are a hydraulic, metal-to-metal gate and seat seal design gate valves.

7. The system of claim 6, wherein said at least three ground valves are configured for dual sided flow and operable to maintain a pressure control from a respective port of entry of each said valve.

8. The system of claim 7, wherein said at least three ground valves are capable of withstanding a working pressure of up to 15,000 psi from either port of entry of each said valve.

9. The system of claim 1, wherein said at least three ground valves are a hydraulic gate valves, said at least three hydraulic gate valves being each individually actuated through an accumulator’s controls of a hydraulic accumulator.

10. The system of claim 1, wherein said at least three ground valves are operated from a distance of approximately 150 to 200 feet.

11. A remotely operated system for use in hydraulic fracturing of ground formations, said remotely operated system comprising:
   an accumulator, having at least three accumulator’s controls, said controls configured to individually control at least three ground valves, wherein said accumulator is positioned in relation to said at least three ground valves at approximately up to 150 feet from the closest of the at least three ground valves and at approximately up to 200 feet from the furthest of the at least three ground valves;
   one or more high pressure hose from the accumulator for flow of pressurized substance, said pressurized substance capable to actuate the at least three ground valves;
   the at least three ground valves disposed within the flow lines between a source of pressurized fracturing fluid and a well head, said at least three ground valves designed for dual side flow and operable to maintain pressure control from a respective port of entry of each said valve;
   a flow-T connector connecting the source of pressurized fracturing fluid with the well head, said flow-T connector designed to receive a fracturing slurry at approximately 45 degree angle.

12. The system of claim 11, wherein said accumulator may be a hydraulic accumulator and powered by any means of energy source.
13. The system of claim 11, wherein the one or more high pressure hose(s) may be a hydraulic or a pneumatic pressure hose.

14. The system of claim 11, wherein the at least three ground valves are a hydraulic, metal-to-metal gate and seat seal design gate valves.

15. The system of claim 11, wherein said at least three ground valves are capable of withstanding a working pressure of up to 15,000 psi from either port of entry of each said valve.

16. The system of claim 11, wherein said at least three ground valves are a hydraulic gate valves, said at least three hydraulic gate valves being each individually actuated through an accumulator’s controls of a hydraulic accumulator.

17. A method of hydraulic fracturing a ground formation comprising:

- disposing at least three ground valves within a flow lines, said flow lines connecting a source of pressurized fracturing fluid with a well head;
- connecting said at least three ground valves through said valves’ inlet and outlet lines with one or more high pressure hose(s);
- connecting said one or more high pressure hose(s) with an accumulator, said accumulator having at least three accumulator’s controls, wherein said accumulator is positioned in relation to the at least three ground valves at approximately up to 150 feet from the closest of said at least three ground valves and at approximately up to 200 feet from the furthest of said at least ground valves; before directing a fracturing slurry from a source of pressurized fracturing fluid through a flow lines, placing said accumulator’s controls in an open position to remotely open each of the at least three ground valves to allow said fracturing slurry to pass through the flow lines; and
- after each fracturing stage is completed, placing said accumulator’s controls for each said at least three ground valve in a close position to stop the flow of the fracturing slurry through the flow lines to the well head.

18. The method of claim 17, wherein said accumulator may be a hydraulic accumulator and powered by any means of energy source.

19. The method of claim 17, wherein the one or more high pressure hose may be a hydraulic or pneumatic pressure hose.

20. The method of claim 17 further comprising:

- connecting a flow-T connector with a flow lines, said flow-T connector designed to receive the fracturing slurry at approximately 45 degree angle.

21. The method of claim 17, wherein the at least three ground valves are hydraulic, metal-to-metal gate and seat seal design gate valves.

22. The method of claim 21, wherein said ground valves are configured for dual sided flow and operable to maintain a pressure control from a respective port of entry of each said valve.

23. The method of claim 22, wherein said at least three ground valves are capable of withstanding a working pressure of up to 15,000 psi from either port of entry of said valves.

24. The method of claim 17, wherein the at least three ground valves are hydraulic gate valves, said the at least three hydraulic gate valves being each individually actuated through an individual control of a hydraulic accumulator.

25. The method of claim 17, wherein said the at least three ground valves are operated from a distance of approximately between 150 to 200 feet.

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