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(54) **LOW COST RIGLESS INTERVENTION AND PRODUCTION SYSTEM**

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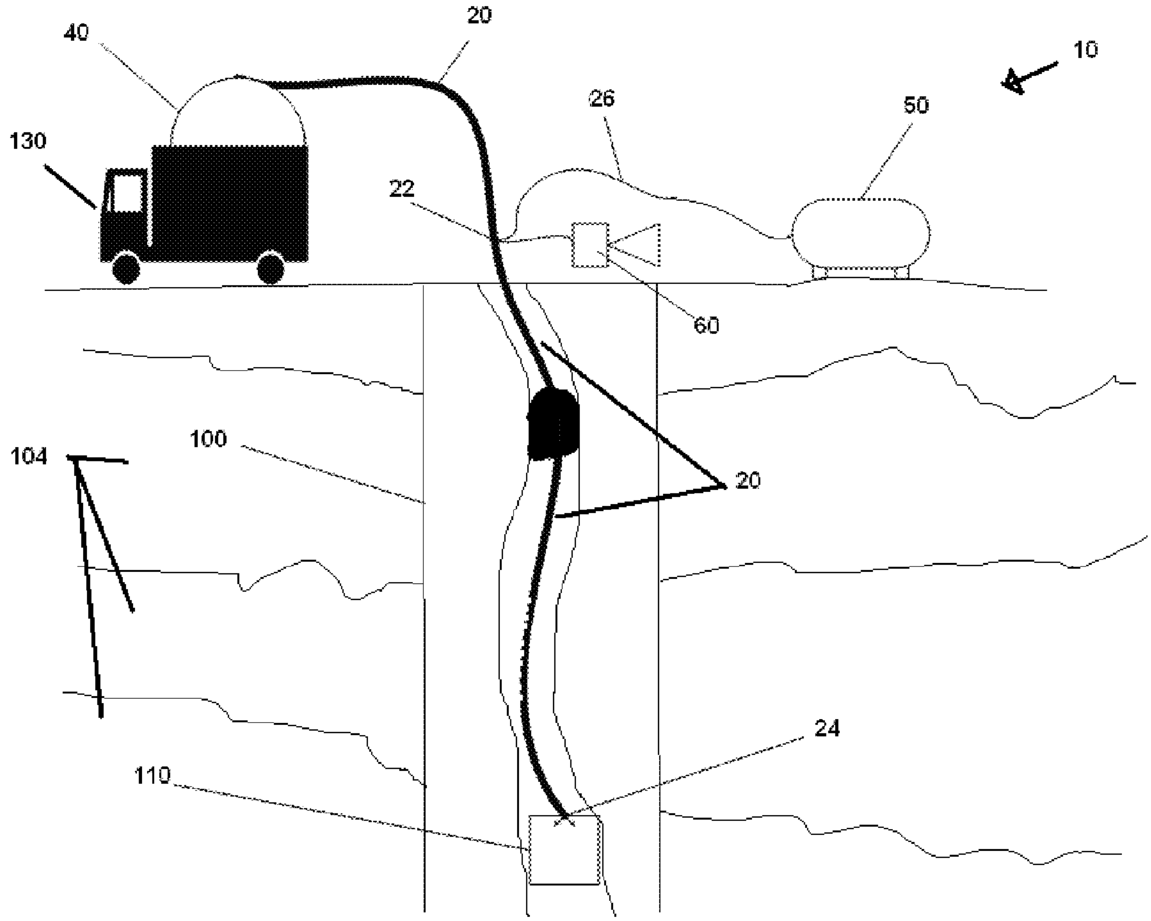
(52) **U.S. Cl.** **166/250.1**; 166/65.1; 166/250.01; 702/6

(57) **ABSTRACT**

A downhole system comprises (a) a wellbore deployable container comprising an operational control circuit and a power source operationally in communication with the operational control circuit, each disposed within the container; a wellbore deployable, controllable downhole electronic frac fluid flow control module further comprising a wellbore deployable container receiving seat; and a data handling circuit; (b) a wellbore deployable, data transmission capable gauge deployable near the control module; and (c) a surface system operatively in communication with the operational control circuit and/or the control module. The control module, container, and data gathering gauge may be deployed within the wellbore; the surface system deployed at the wellbore's surface; communications established between the gauge, surface system, and operational circuit; and a data transmission command issued from the surface system to the container to trigger transmitting data from the container to the surface system to control a wellbore fluid process.



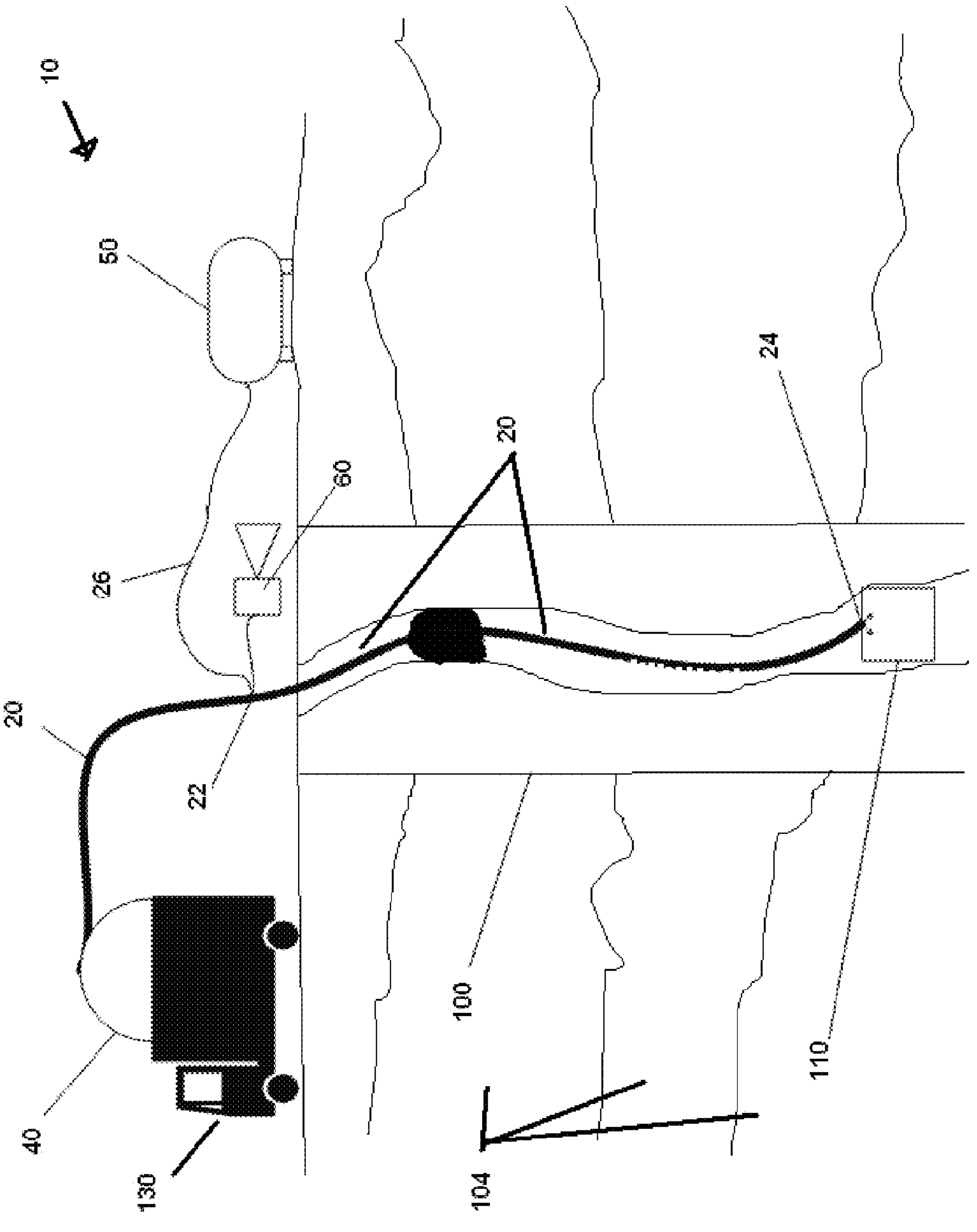


FIGURE 1

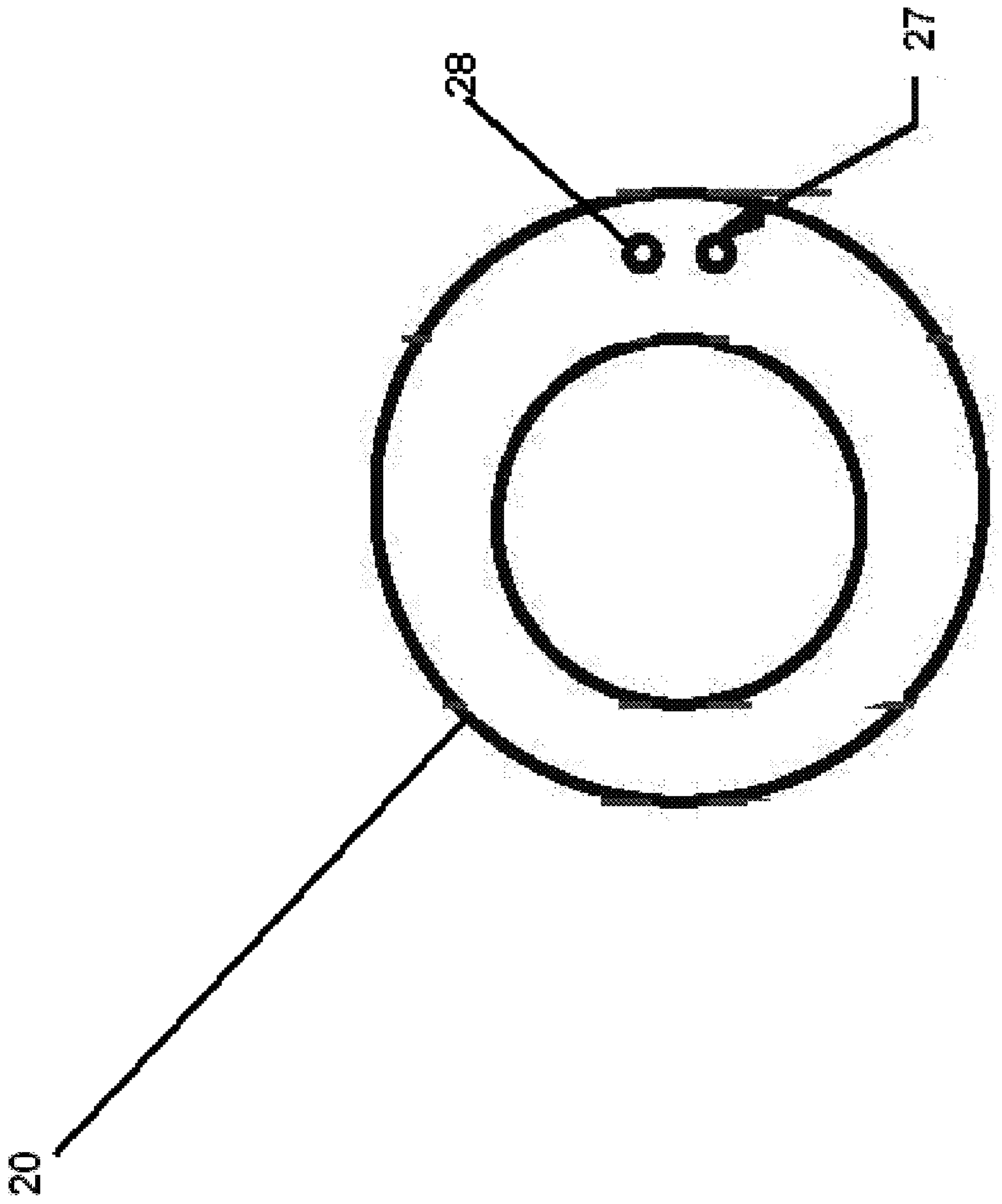


FIGURE 2

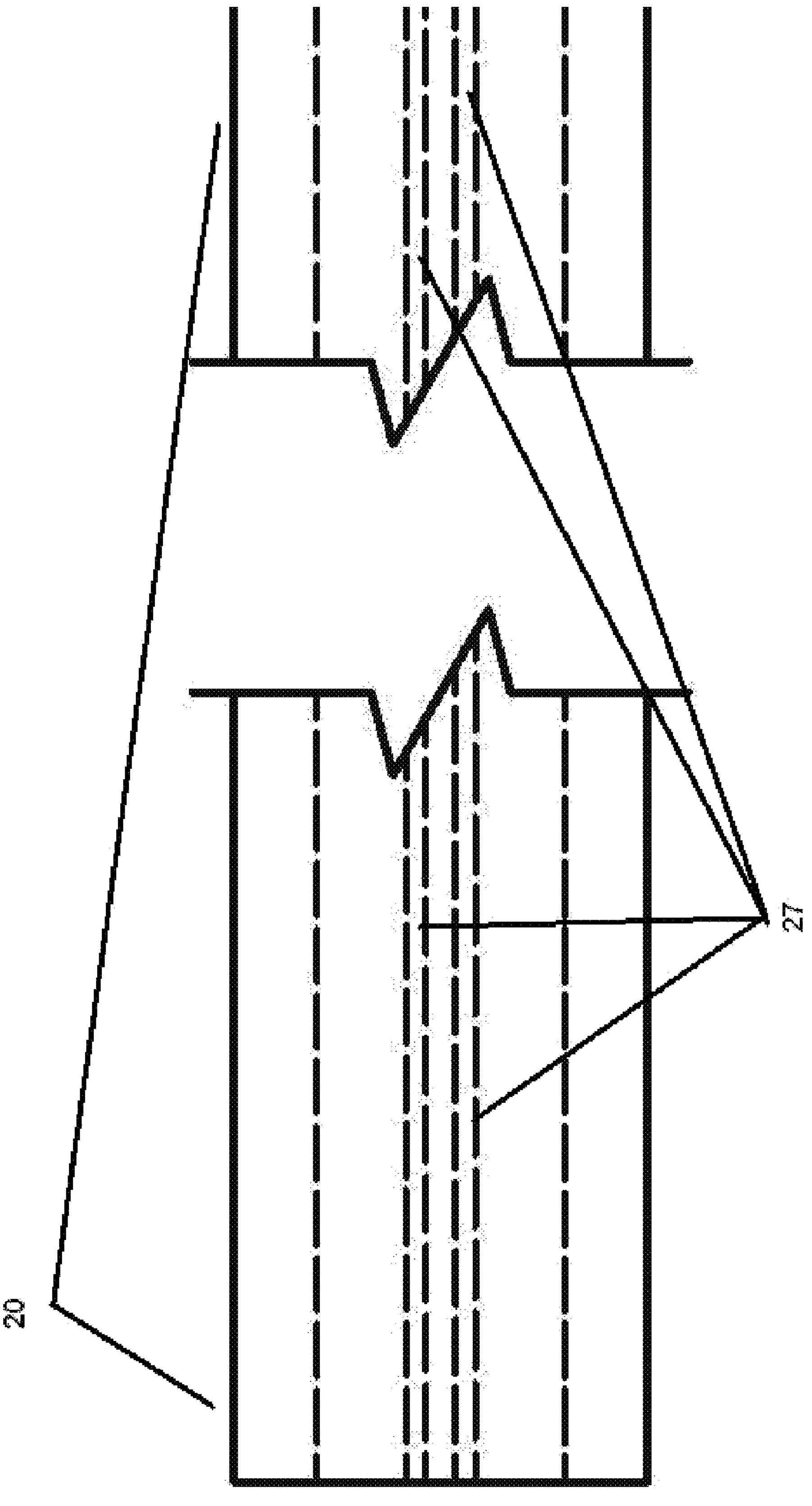


FIGURE 3

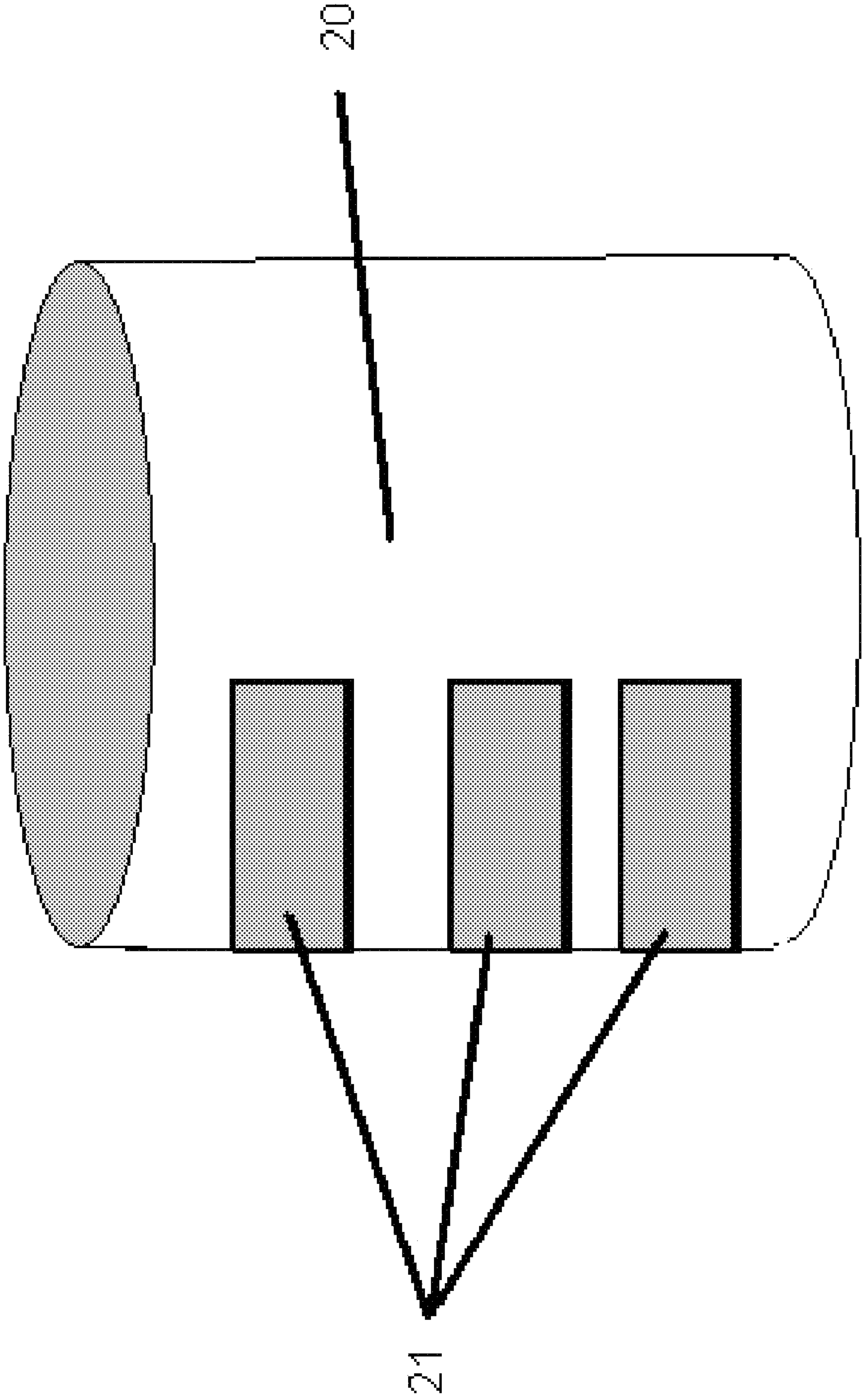


FIGURE 4

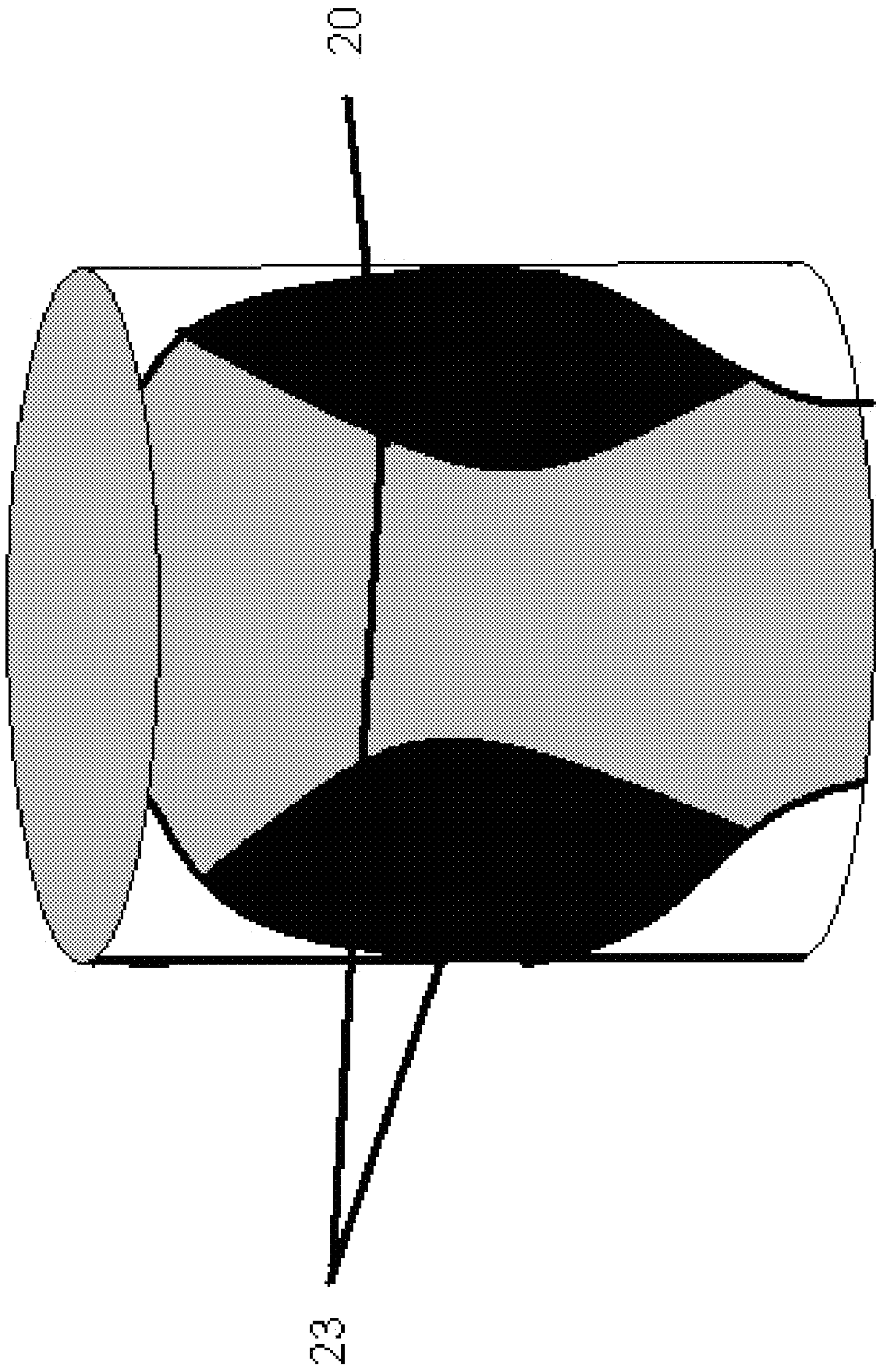


FIGURE 5

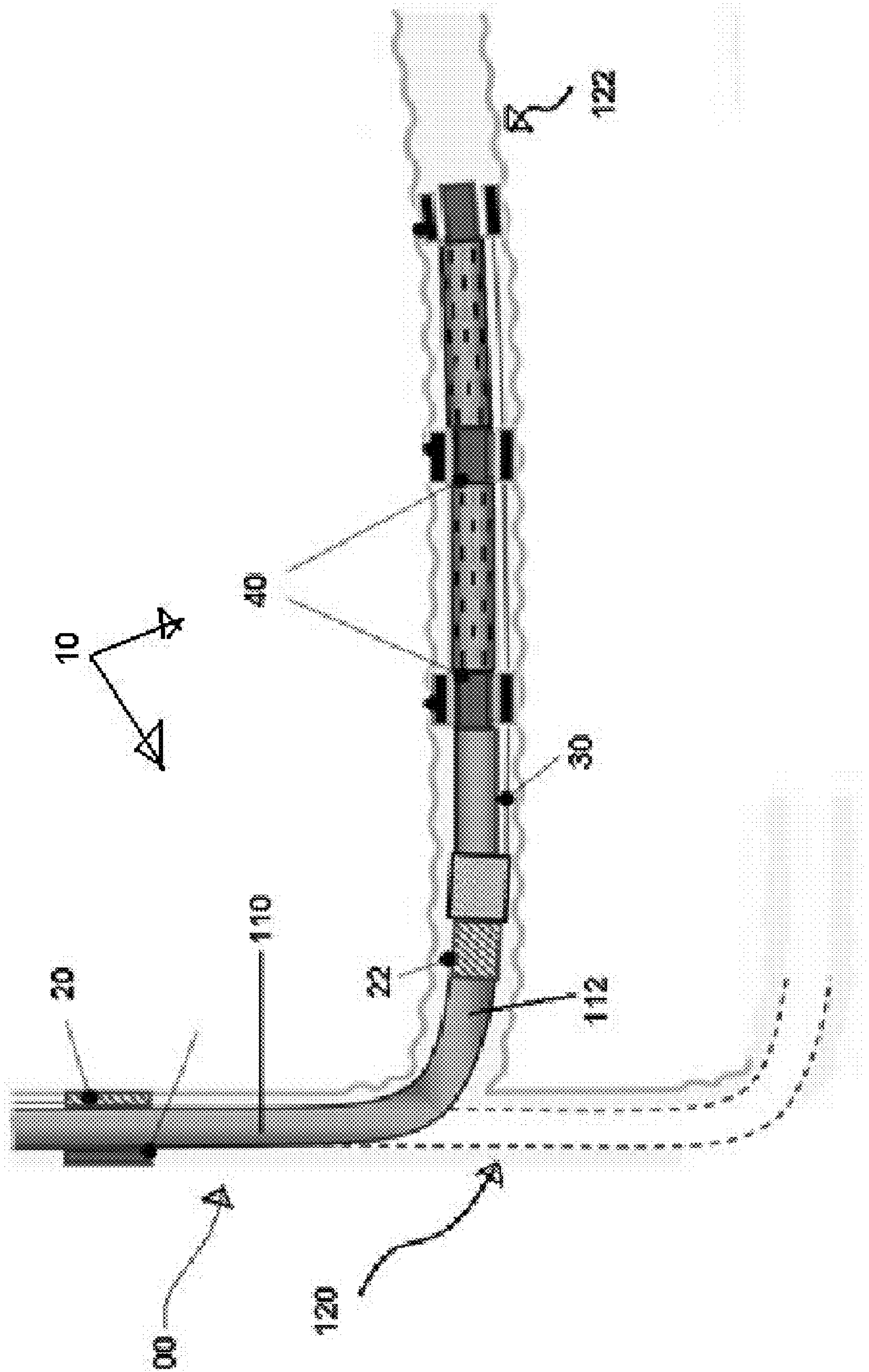


FIGURE 6

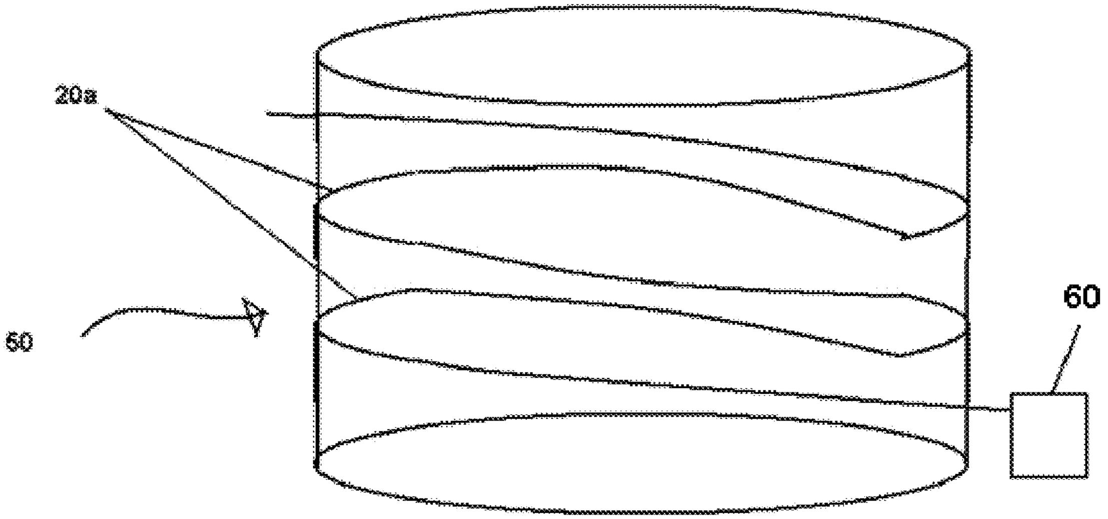


FIGURE 7

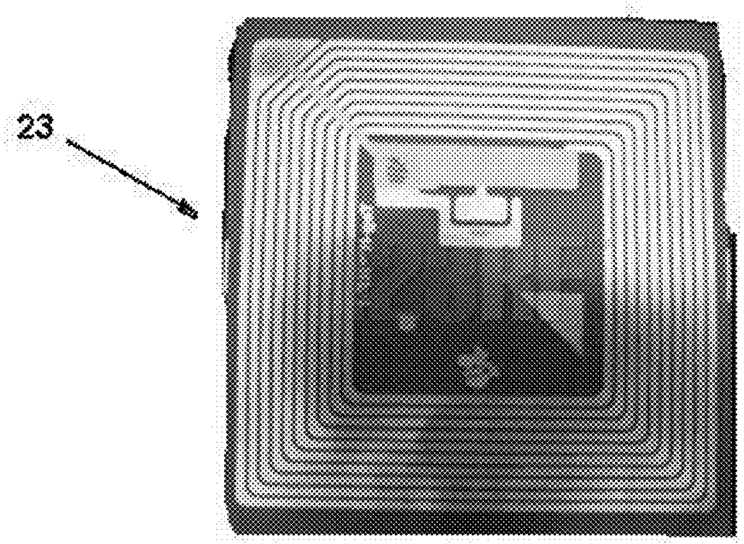


FIGURE 7a

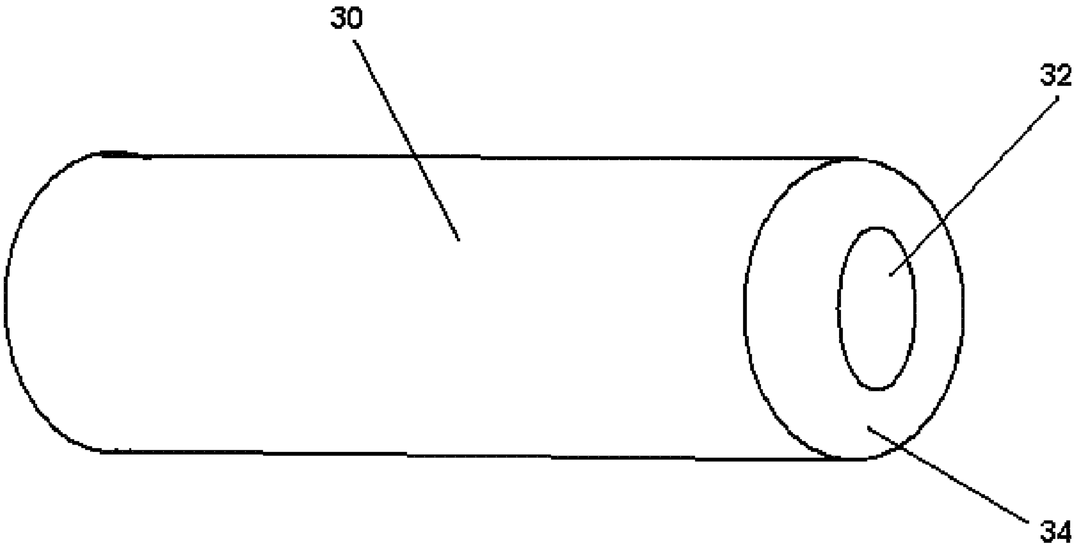


FIGURE 8

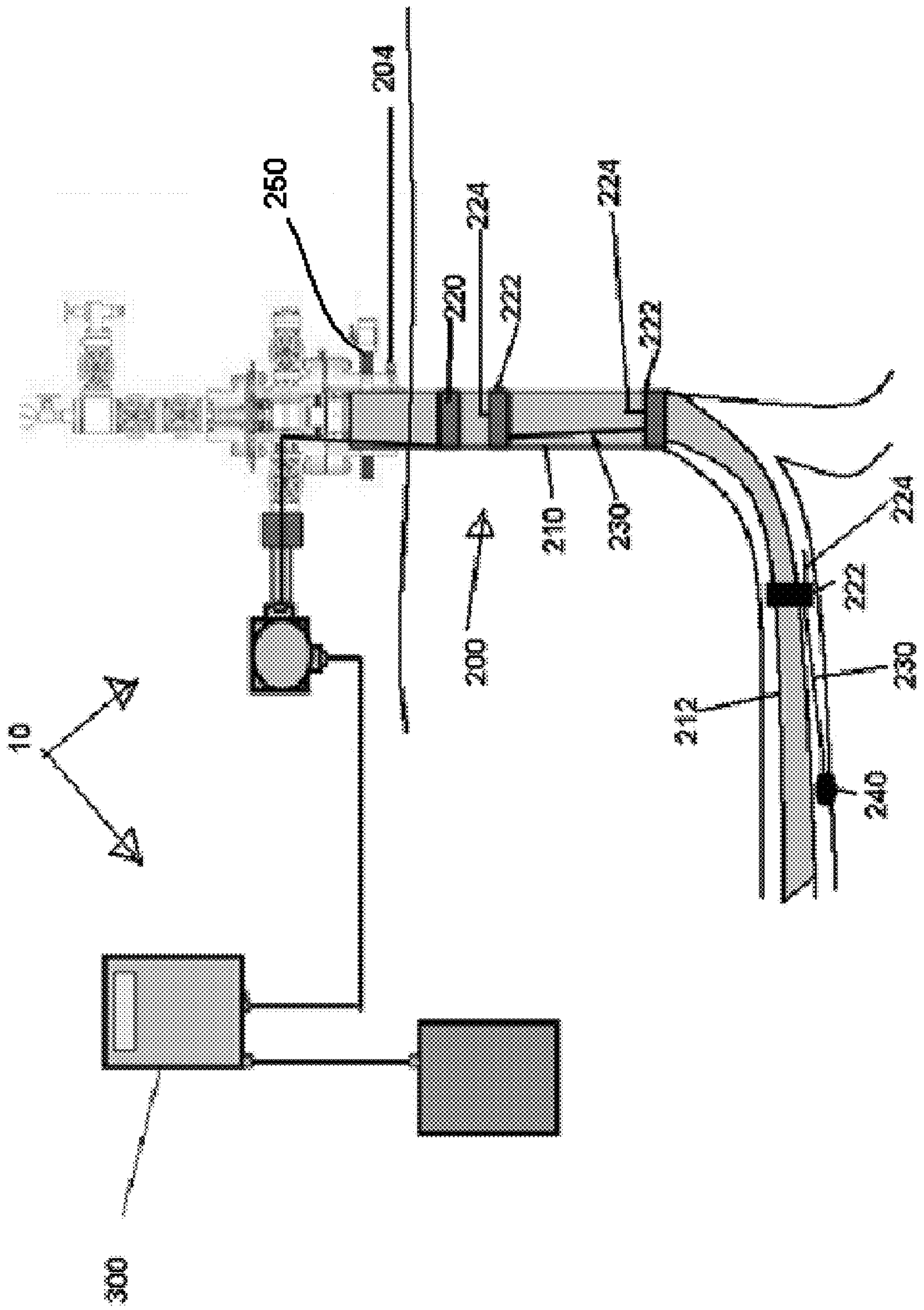

10
300
250
204
220
222
224
224
222
200
210
230
224
222
230
212
240

FIGURE 9

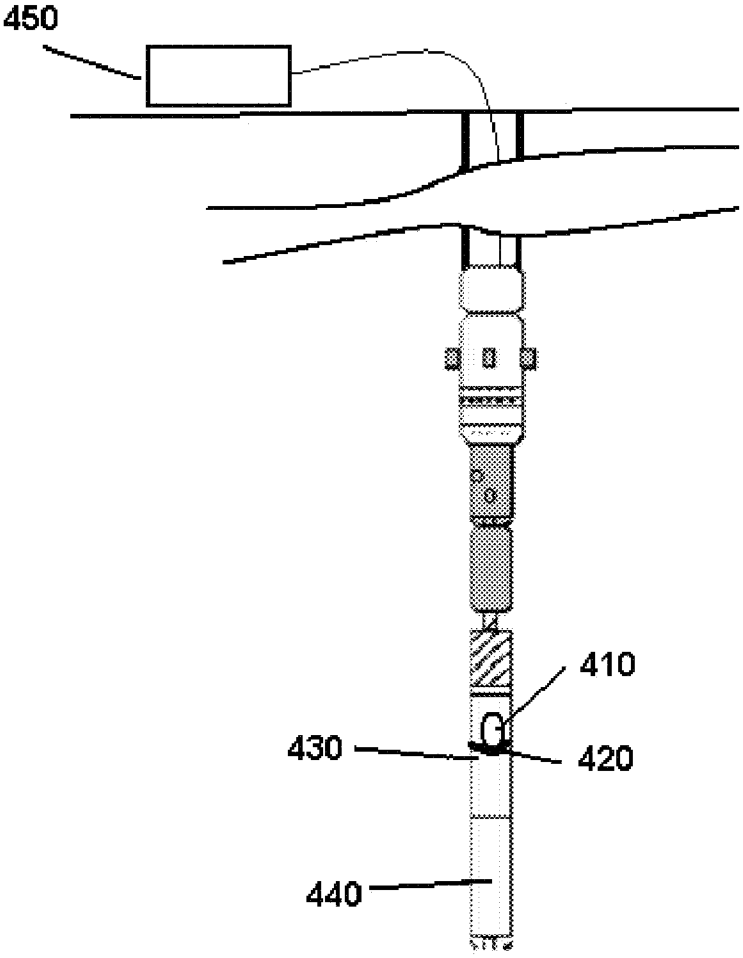


FIGURE 10

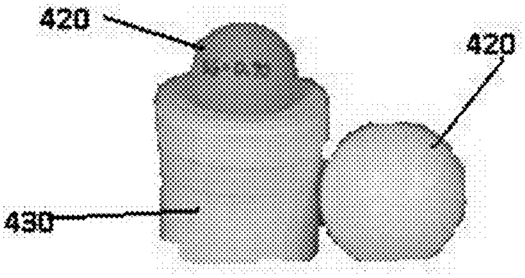


FIGURE 11

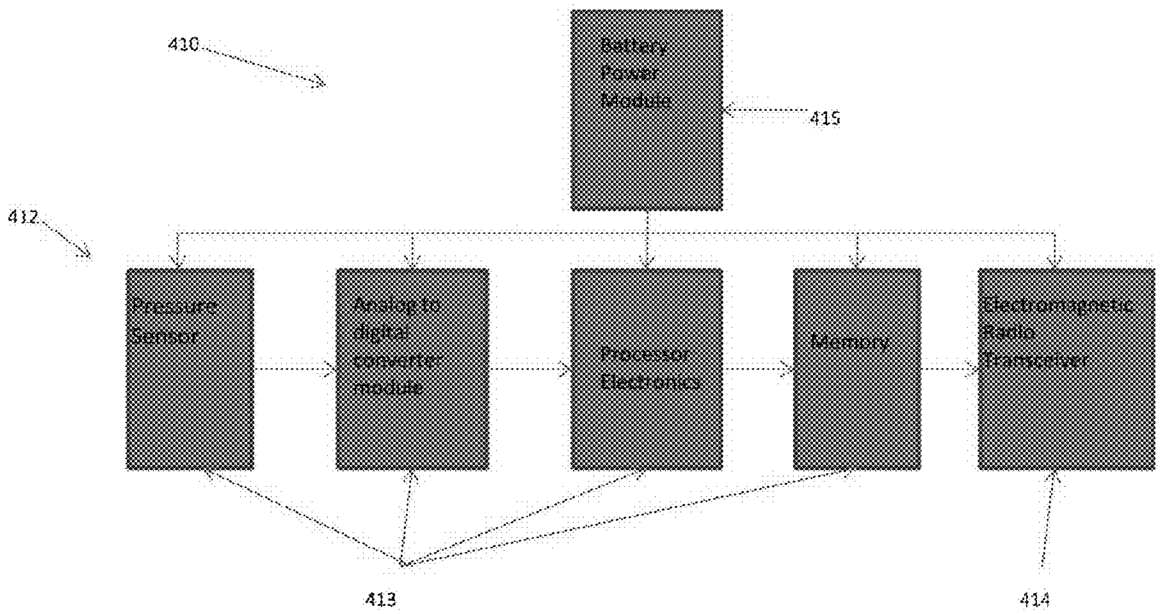

410
Battery Power Module
415
412
Pressure Sensor
Analog to digital converter module
Processor Electronics
Memory
Electromagnetic Radio Transceiver
413
414

FIGURE 12

LOW COST RIGLESS INTERVENTION AND PRODUCTION SYSTEM

RELATION TO OTHER APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Application No. 61/159,589, filed on Mar. 12, 2009 and is a continuation-in-part of U.S. application Ser. No. 12/463,523 filed on May 11, 2009 and of U.S. application Ser. No. 12/550,777 filed on Aug. 31, 2009.

BACKGROUND OF THE INVENTION

[0002] Currently, deployment and retrieval of downhole devices such as pumps and production pipes requires a rig, which can be costly. Further, wellbore tubulars tend to be made of metals which may corrode and are rigid, leading to less flexible installation procedures.

[0003] Over the past 10 years, the application of non-metallic materials in flowlines such as in those used wellbores has proven itself an alternative to metallic flowlines. Metallic materials tend to be less resistant to corrosion and/or chemicals and their rigidity is a factor to be taken into consideration during installation and use.

[0004] Providing power to equipment needing power in a wellbore has meant providing long runs of cabling, self-powered equipment, or both downhole. These methods are costly and, in the case of systems using a power cable, can require extensive rework if the power cable should go bad. Further, it is not possible to provide power or communications in a main or lateral wellbore where no continuous tubing exists since there is a break in the cable.

[0005] There is a need for a system that monitors data in the wellbore during and after the frac job. Such a system may be used in horizontal sections of the well to separate the well into multiple zones to collect data during a frac and transfer data and commands.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] The various drawings supplied herein are representative of one or more embodiments of the present inventions.

[0007] FIG. **1** is a diagram of an exemplary system embodiment;

[0008] FIGS. **2** and **3** are perspectives in partial cutaway of an exemplary tube illustrating embedded umbilical and/or electrical cables;

[0009] FIG. **4** is an exemplary plan view of a tube with filters; and

[0010] FIG. **5** is an exemplary plan view of a tube with deformable material.

[0011] FIG. **6** is a drawing in partial perspective of a wellbore illustrating a pipeline where the use of wireless short hop power transfer provides the ability to eliminate a cable through the deviated section of the wellbore;

[0012] FIG. **7** is a drawing in partial perspective of a receiver, and FIG. **7***a* is an illustration of an exemplary RF receiver;

[0013] FIG. **8** is a drawing in partial perspective of a cable;

[0014] FIG. **9** is drawing in partial perspective of a representative system;

[0015] FIG. **10** is drawing in partial perspective of a frac ball system;

[0016] FIG. **11** is drawing in partial perspective of a frac ball system; and

[0017] FIG. **12** schematic representation of a container comprising an operational circuit and a power source.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

[0018] As used herein, "tube" will be understood by one of ordinary skill in these arts to include a production pipe, an injection pipe, a portion of a tubular to be used within a wellbore, a portion of a tubular to be used within another tubular, or the like.

[0019] Referring now to FIG. **1**, rigless intervention and production system **10** comprises flexible, non-metallic, substantially continuous tube **20** and connector **30**.

[0020] Tube **20** comprises a high temperature tolerant, non-metallic material such as a carbon-enhanced, resin-based themoplastic, a fluoropolymer, a polyemide material, or the like, or a combination thereof. Kevlar® or other similar materials may be used as part of the tube wall to strengthen tube **20** such as to improve pressure collapse and burst properties.

[0021] In typical embodiments, a predetermined portion of tube **20** is dimensioned and configured to be deployed within wellbore **100**, with the predetermined portion of tube **20** further comprising first connection end **24** disposed distally from fluid outlet **22**. Tube **20** is typically dimensioned and configured into continuous lengths to reach a desired wellbore depth, typically from around between 6,000 feet to around 10,000 feet. In typical embodiments, tube **20** can withstand a maximum working pressure of around 15,000 psi (1,034 bar).

[0022] Referring additionally to FIGS. **2** and **3**, tube **20** may further comprise umbilical **26** and/or electrical cable **27** which may be disposed about a predetermined portion of tube **20**, such as about an interior or exterior surface of tube **20**, or at least partially embedded into tube **20**. In certain configurations, umbilical **26** may further comprise electrical cable **27**.

[0023] Annulus **28** of tube **20** is typically dimensioned and configured to allow fluids to be pumped into wellbore **100**.

[0024] Connector **30** is typically attached to first connection end **24** and dimensioned and configured to sealably attach tube **20** to tool **110** which is deployable within wellbore **100**, e.g. pump **110***a* (not specifically shown in the figures), downhole gauge **110***b* (not specifically shown in the figures), sensors **110***c* (not specifically shown in the figures), or the like, or a combination thereof. Tools **100** such as downhole gauge **110***b* may be used to optimize production from wellbore **100**. For example, downhole gauge **110***b* may be dimensioned and configured to measure pressure of injected water near the bottom of wellbore **100**, temperature of injected water near the bottom of wellbore **100**, or the like, or a combination thereof. As used herein, "wellbore" and "well" may be used synonymously, as the context requires.

[0025] Sensors **110***c* may be embedded into tube **20** such as during the manufacturing process. These sensors **110***c* may comprise induction system sensors for formation evaluation and fluid evaluation; radio frequency identification sensors (RFID); pressure and temperature sensors, or the like, or combinations thereof. Sensors **110***c* may be operatively connected to cable **27**, e.g. using wired or wireless connections, umbilical **26**, or to a cable disposed outside tube **20**. Fiber wire **28** may also be embedded or otherwise disposed inside tube **20** and used for sensing downhole data such as data regarding production status, fluid configuration, fluid flow, fluid density, microseismic data, strain, pressure, temperature, or the like, or a combination thereof. As will be apparent to one of ordinary skill in these arts, sensor **110***c* may be a plurality of sensors **110***c* embedded at a corresponding plurality of locations in tube **20** or gathered into less than a corresponding plurality of locations in tube **20**. Sensors **110***c* may further comprise one or more coils dimensioned and configured to provide formation evaluation data, data communications, or the like, or a combination thereof.

[0026] In certain embodiments, tube spooler **40** is operatively connected to tube **20**, i.e. tube **20** may be spooled and/or unspooled from tube spooler **40**. Tube spooler **40** may comprise a power cable spooler or a combination of a power cable and a tube spooler.

[0027] Vehicle **130** may be part of rigless intervention and production system **10** and dimensioned and configured to accept tube spooler **40**. One or more tube spoolers **40** and/or power cable spoolers may be located in the same unit for deployment, e.g. vehicle **130**.

[0028] In currently contemplated embodiments, vehicle **130** comprises mast **132** and controller **134**. Controller **134** is operatively in communication with tube spooler **40**. Controller **134** controls the tension on tube **20**, depth of tube **20** into wellbore **100**, as well as control the starting and stopping of tube spooler **40**. Controller **134** may be an electro-hydraulic controller, an electronic controller, or the like, or a combination thereof.

[0029] Rigless intervention and production system **10** may further comprise power generator **50**. Typically, power generator **50** is a steam-powered electricity generator disposed at or near a surface location of wellbore **100**. Power generator **50** may be in fluid connection with fluid outlet **22** to allow use of water from wellbore **100** obtained through fluid outlet **22** to be turned into steam to provide power for power generator **50**. In currently envisioned embodiments, power generator **50** may be dimensioned and configured to use natural gas to generate heat to boil the water into steam for use by power generator **50**. The water and natural gas may be obtained from wellbore **100**, transported from a remote location, or the like, or a combination thereof.

[0030] Injector **60** may be present and operatively in fluid communication with tube **20** and used at wellhead **102** for the deployment of the system in wellbore **100**. In these embodiments, injector **60** is dimensioned and configured for injection of fluids into wellbore **100** from the surface through a predetermined portion of tube **20**. These fluids are typically usable for water injection suitable for well desalination or chemical injection.

[0031] Tube stop **120**, which may include devices such as packers, may be deployed in wellbore **100** to secure tube **20** to a predetermined location in wellbore **100**, such as near well perforations.

[0032] In further embodiments, a tool such as packoff unit **130** or tube hanger (not shown in the figures) is dimensioned and adapted to secure tube **20** inside wellbore **100** near wellhead **102**. Tool **130** would typically be attached to the casing wall.

[0033] In certain embodiments, tube **20** further comprises a material disposed about an outer surface of tube **20**. This material may be disposed along one or more predetermined lengths of tube **20** that match predetermined geological zone **104** in wellbore **100** that needs to be isolated. The material is configured and adapted to swell when in contact with a fluid, such as hydrocarbon or other fluids such as water, such that the material swells and seals the area between the outside of flexible non-metallic continuous tube **20** and well casing **104** or a geological formation when the material gets in contact with the activating fluid. For embodiments where the geographical zone comprises a plurality of zones in wellbore **100**, the material may be disposed along different lengths of tube **20** where each such length matches one of the geological zones. This configuration can be used to isolate a zone in wellbore **100** where metallic production tube may be leaking. In this case, tube **20** can be deployed through the production tube and the production would then continue through tube **20** as opposed to the original production tube.

[0034] By way of example and not limitation, in certain embodiments, isolation material such as rubber formation isolation material can be attached to packoff unit **130**, tube **20**, or both, either permanently or removably. This material may be swell when in contact with a fluid, such as hydrocarbon or other fluids such as water, such that the material swells and seals the area between the outside of flexible non-metallic continuous tube **20** and well casing **104** or a geological formation when the material gets in contact with the activating fluid.

[0035] Referring now to FIG. **6**, system **10** is dimensioned and configured to provide wireless communication of electromagnetic energy to and in wellbore **100** and its components such as to and in components in main wellbore **120** and lateral wellbore **122**. As used herein, electromagnetic energy includes energy usable for power, data, or the like, or a combination thereof.

[0036] In a typical embodiment, system **10** comprises first module **20**, which further comprises self-resonant coil **50** (FIG. **7**); electromagnetic energy transmission cable **30** which is dimensioned and adapted to be deployed in wellbore **100**; and second module **22**, which further comprises its own self-resonant coil **50** and is located at a second distance from first module **20** within wellbore **100**. Second module **22** is operatively in communication with electromagnetic energy transmission cable **30** such as by physical attachment.

[0037] Referring additionally to FIG. **7**, first module **20** is typically located at a first distance with respect to wellbore **100**, e.g. near the surface of wellbore **100**, and typically comprises one or more self-resonant coils **50** which are typically coupled inductively to oscillating circuit **60**. In a strongly coupled regime, first module **20** is dimensioned and configured to allow its self-resonant coil **50** to transfer non-radiative power transfer over a predetermined distance which, in a preferred embodiment, may be up to 8 times the radius of self-resonant coil **50**. For example, in currently preferred embodiments, self-resonant coil **50** comprises electromagnetic energy conducting wire **20***a* having a total length L and cross-sectional radius CR wound into a helix of N turns with radius R and height H. The distance between first and second modules **20**,**22** (FIG. **6**) may be between around 1 times the radius CR to around **8** times the radius CR.

[0038] Referring back to FIG. **6**, second module **22** and its one or more self-resonant coils **50** (FIG. **7**) are typically located at a second distance into wellbore **100**, e.g. inside wellbore **100**, and are operatively in communication with electromagnetic energy transmission cable **30** such as by physical attachment. Second module **22** typically comprises one or more self-resonant coils **50** which are dimensioned and adapted to convert electromagnetic energy from first module **20** into electrical energy, as will be understood by those of ordinary skill in these arts.

[0039] In second module **22**, self-resonant coil **50** (FIG. **7**) is typically coupled inductively to a resistive load, which, by way of example and not limitation, may be one or more gauges **40**, e.g. a pressure and/or temperature gauge, where such gauges **40** are located deeper into wellbore **100**. The inductive coupling may be wirelessly or via a cable such as cable **30** or another cable (not shown in the figures).

[0040] Second module **22** may further comprise a pulse receiver, an RF receiver, or the like, or a combination thereof (an exemplary RF receiver is shown at **23** in FIG. **7***a*). Suitable RF receivers are manufactured by GAO RFID, 93 S. Jackson Street #57665, Seattle, Wash. 98104-2818. Second module **22** can be located at a predetermined location such as where there may not be a continuous pipe from main wellbore **100** into lateral wellbore **122**, e.g. at or near the entrance of lateral wellbore **122**. In certain contemplated embodiments, energy can be transferred from main wellbore **100** to lateral wellbore **122** using a plurality of first modules **20** (the plurality are not shown in the figures) and then on to second module **22** which converts the energy into electrical energy. Data may also be transmitted between one or more second modules **22** and one or more first modules **20**.

[0041] Referring additionally to FIG. **8**, electromagnetic energy transmission cable **30** typically comprises center conductor **32** and ground **34**. Ground **34** is most typically a metal sheath or tube used to provide an electrical ground return. Cable **30** is of a type suitable for use in wellbores **100** and/or, e.g., **122**, as will be familiar to those of ordinary skill in these arts. Electromagnetic energy transmission cable **30** is dimensioned and configured to carry electrical power energy, data, or the like, or a combination thereof. Data communication utilizing electromagnetic energy transmission cable **30** typically comprises transferring data from one or more modules **22** (FIG. **6**) deeper in wellbore **100** or **122** (FIG. **6**) to a module closer to the surface, e.g. first module **20** (FIG. **6**).

[0042] Referring back to FIG. **6**, in currently contemplated embodiments, first and second modules **20**,**22** may be deployed inside production tubing **110**, and their respective coils **50** (FIG. **7**) are dimensioned and adapted to allow for power transfer inside production tubing **110**, for example at spacing distances of around **2** meters. It is contemplated that first and second modules **20**,**22**, when installed inside production tubing **110**, are to be further dimensioned and configured to minimize restriction of fluids such as hydrocarbons flowing in production tubing **110**, e.g. fluids would flow through or around the modules **20**,**22**.

[0043] It is understood that a plurality of first and second modules **20**,**22** may exist in system **10**. Further, in certain contemplated embodiments, first and second modules **20**,**22** are selectively insertable and retrievable from inside wellbore **100** such as to allow running logging tools in wellbore **100**.

[0044] Referring now to FIG. **9**, in a further embodiment, system **10** may be dimensioned and configured for wireless communications from main bore **210** to lateral bore **212** in wellbore **200**. In this configuration, system **10** typically comprises surface power system **300** which is dimensioned and adapted to generate electromagnetic energy to be transmitted into wellbore **200**. Such power systems are well known to those of ordinary skill in these arts. Power system **300** may further comprise data processing capabilities, e.g. a microprocessor and memory, and be used to process data received from a device deployed downhole in wellbore **200**, e.g. gauge **240**. First module **220** is operatively in communication with surface power system **300** such as by a wired and/or wireless connection. Cable **230** is disposed proximate the outside of tubing **210** and cable **232** is disposed proximate the outside of tubing **212** which is deployed in lateral bore **222** of wellbore **200** during the deployment of tubing **212**. A plurality of second modules **222** may be present and operatively in communication with first cable **230** where at least one of the plurality of second modules **222** is deployed in lateral bore **222**. A predetermined number of second modules **222**, e.g. each such second module **222**, may further comprise a pulse receiver, an RF receiver, or the like, or a combination thereof.

[0045] In certain configurations, first module **220** comprises coil antenna **224** deployed in main wellbore **210** of wellbore **200**. Further, a predetermined number of the plurality of second modules **222**, typically each such second module **222**, comprises its own coil antenna **224**, with each such coil antenna **224** being mounted on the outside of production tubing **210** deployed in wellbores **220**, **222**. In currently preferred embodiments, coil antenna **224** of second module **222** located in lateral wellbore **222** is dimensioned and configured to transmit data to first module **220** located in main wellbore **220**, and lateral antenna **224** of first module **220** is dimensioned and configured to transmit data to the surface system **300**.

[0046] System **10** may further comprise second cable **232** deployed in wellbore **200**; wellbore device **240** deployed in wellbore **200**; and distribution module **224** located proximate entrance **222***a* of lateral wellbore **222**. Wellbore device **240**, which may be a gauge, sensor, flow control device, or the like, or a combination thereof, is operatively coupled to second cable **230** to permit electromagnetic energy to pass between wellbore device **240** and second cable **230**. Distribution module **222** is typically dimensioned and adapted to receive electromagnetic energy and route the electromagnetic energy into second cable **230**.

[0047] System **10** may further comprise one or more wireless power crossover module **250** deployed in a pipe disposed outside wellhead **204** to interface with module **240** inside wellbore **200**. Wireless power crossover modules **222** are wirelessly coupled to provide power into wellbore **200** as well as data communication from inside wellbore **200** to a device such as a subsea pod located proximate to wellhead **204** without the need for a wellhead penetration.

[0048] In certain embodiments, system **10** may further comprise safety valve **270** dimensioned and configured to allow electromagnetic energy to wirelessly communicate through **270** safety valve, bypassing **270** safety valve without affecting its operations.

[0049] Referring now to FIGS. **10**-**12**, downhole system **400** may comprise one or more containers **410** dimensioned and configured for deployment in wellbore **100**; seat **420** dimensioned and configured for deployment in wellbore **100**; one or more gauges **430** dimensioned and configured for deployment in the wellbore **100** near one or more containers **410**; controllable downhole electronic frac fluid flow control **440** dimensioned and configured for deployment in wellbore **100**; and surface system **450**.

[0050] Referring specifically to FIG. **12**, each container **410** typically comprises operational circuit **412** and power source **415**, either or both of which may be disposed within container **410**.

[0051] Operational circuit **412** may further comprise data collection circuit **413** dimensioned and configured to gather and store at least one of frac pressure data or temperature data and electromagnetic communications circuit **414** dimensioned and configured to obtain data from a downhole gauge such as gauge **430**.

[0052] Data collection circuit **413** is typically dimensioned and configured to gather and store predetermined data stored in downhole electronic frac fluid flow control **440**. These data may include pressure, temperature, flow, water cut, sleeve position, and the like, or a combination thereof. Electromagnetic communications circuit **414** is typically operatively in communication with data collection circuit **413**.

[0053] Power source **415** is operationally in communication with operational circuit **412** and may be a battery, fuel cell, or the like, or similar to first module **20**, electromagnetic energy transmission cable **30**, and second module **22** as described above. Container **410** is typically is built around the electronics it is to house and may be substantially spherical but can be of any appropriate shape, e.g. ovoid or elliptical. Container **410** typically comprises a material that can withstand frac pressure and erosion, such as phenolic.

[0054] In certain contemplated embodiments, container **410** is placed as a separate module located as part of a frac or production string deployed in wellbore **100**. Container **410** may be dimensioned and configured to seal wellbore **100** or, alternatively, to be deployed with coil tubing, slick line or other means in the well for retrieval of the data stored in the electronic of the seat, frac control module or gauge module.

[0055] Seat **420** is typically further dimensioned and configured to receive one of the containers **410**. In a currently envisioned embodiment, each container **410** will be received by its own seat **420**.

[0056] Gauge **420** is typically associated with a specific container **410** and, more typically, disposed proximate or on at least one of seat **420** or in a separate module in a pup joint assembly deployed in wellbore **100**. In certain contemplated embodiments, gauge **430** further comprises a pressure and temperature gauge, electronics to condition the gauge signal, an analog to digital converter, a processor and memory to store the information, and an electromagnetic communications system to transfer data from gauge **430** to container **410**. Gauge **410** is typically disposed proximate to or as part of downhole electronic frac fluid flow control **440**.

[0057] Controllable downhole electronic frac fluid flow control **440** is dimensioned and configured for deployment in wellbore **100**. Downhole electronic frac fluid flow control **440** is further typically dimensioned and configured to control fluid flow within wellbore **100**. The fluid flow may be fluid flow from a reservoir to the inside of wellbore **100**, the flow of frac fluid from wellbore **100** into the reservoir, or the like, or a combination thereof. Downhole electronic frac fluid flow control **440** typically comprises battery operated DC motor **442** (not shown in the figures) and valve **444** (not shown in the figures) dimensioned and configured to operate downhole electronic frac fluid flow control **440**, i.e. to open and close valve **444** and thus permit flow of fluid within wellbore **100**. Valve **444** may be a ball and seat valve.

[0058] Downhole electronic frac fluid flow control **440** is dimensioned and configured to be operated by a command issued from surface system **450**, from container **410** (e.g. one lowered in wellbore such as with EM communications), or the like, or a combination thereof.

[0059] In certain contemplated embodiments, container **410** moves downhole electronic frac fluid flow control **440**, e.g. to open it for the frac fluid to reach the reservoir to frac.

[0060] Surface system **450** is operatively in communication with operational circuit **412** disposed within container **410**, the downhole electronic frac fluid flow control **440**, or the like, or a combination thereof. Surface system may comprise electromagnetic communications module **452** dimensioned and configured to communicate with container **410** and interface **454** to a personal computer.

[0061] In the operation of preferred embodiments, a wellbore fluid may be processed by deploying one or more controllable downhole electronic frac fluid flow control **440** to a set of first predetermined positions in wellbore **100**; deploying one or more containers **410** to a second set of predetermined positions in wellbore **100**; deploying one or more gauges to a third set of predetermined positions in wellbore **100**; deploying surface system **450** at a surface of wellbore **100**; establishing communications between gauge **430** and operational circuit **412** disposed within container **410**; establishing communications between surface system **450** and operational circuit **410** disposed within container **410**; issuing a data transmission command from surface system **450** to container **410**; and transmitting a first predetermined set of data from container **410** to surface system **450** upon receipt of the data transmission command from surface system **450**. The first predetermined set of data may include data useful for formation monitoring, pump optimization, or the like, or a combination thereof.

[0062] As will be understood by one of ordinary skill in the downhole tool arts, multiple containers **410** can be deployed to be located proximate each frac control module **440**, e.g. on or near the top of a corresponding frac control module **440**. Container **410**, once deployed, may be retrieved the surface of wellbore **100** and its data retrieved at the surface.

[0063] As described above, each gauge **430** can be integrated into frac control module **440**, deployed proximate to downhole electronic frac fluid flow control **440**, or be located on a separate container deployed near frac control module **440**. One or more of gauges **430** may gather a second predetermined set of data and provide that second predetermined set of data to surface system **450** upon receipt of a data transmission command from surface system **450**. The second predetermined set of data, which may include pressure data, temperature data, flow data, water cut data, control position data, or the like, or a combination thereof, may be stored in downhole electronic frac fluid flow control **440** for retrieval at a later date by container **410** with the electronics.

[0064] The wellbore fluid process may be a frac fluid process, a wellbore chemical process, a monitoring process, or the like, or a combination thereof. One or more of gauges **430** may be a sleeve gauge used to collect data after the frac, e.g. for build up tests. Gauge **430** is typically deployed without the need for a downhole wired communication connection to gauge **430** and the data are preferably retrieved wirelessly.

[0065] Data communications may be establishing between downhole electronic frac fluid flow control **440** and a predetermined module **400** deployed in wellbore via slickline, coil tubing, pumping or any other means to deploy hardware in the wellbore. The data are preferably retrieved wirelessly.

[0066] Wellbore **100** may comprise a horizontal section. At such sites, downhole electronic frac fluid flow control **440** and container **410** may be used to separate wellbore **100** into separate sections, with downhole electronic frac fluid flow control **440** and container **410** collecting data during a frac and transfer data and commands between the frac control and the container.

[0067] Container **410** may comprise a ball and seat which may be used to aid in isolating a wellbore zone, e.g. during an acid jobs to clean the formation face at the well. This may include collecting data at seat **420** and transferring these data to container **410** for storage.

[0068] The foregoing disclosure and description of the inventions are illustrative and explanatory. Various changes in the size, shape, and materials, as well as in the details of the illustrative construction and/or a illustrative method may be made without departing from the spirit of the invention.

We claim:

1. A downhole system, comprising:

a. a container dimensioned and configured for deployment in a wellbore, the container further comprising:
   i. an operational control circuit disposed within the container; and
   ii. a power source disposed within the container, the power source operationally in communication with the operational control circuit;
b. a controllable downhole electronic frac fluid flow controller dimensioned and configured for deployment in the wellbore, the controllable downhole electronic frac fluid flow controller further comprising:
   i. a seat dimensioned and configured for deployment in the wellbore as part of the controllable downhole electronic frac fluid flow control, the seat further dimensioned and configured to receive the container; and
   ii. a data handling circuit;
c. a gauge dimensioned and configured for deployment in the wellbore near the frac control module, the gauge further dimensioned and configured for data transmission; and
d. a surface system, operatively in communication with at least one of (i) the operational control circuit disposed within the container or (ii) the downhole electronic frac fluid flow control data handling circuit.

2. The downhole system of claim **1**, wherein the operational circuit further comprises:

a. a data collection circuit dimensioned and configured to gather and store at least one of frac pressure data or temperature data; and
b. an electromagnetic communications circuit dimensioned and configured to obtain data from a downhole gauge, the electromagnetic communications circuit operatively in communication with the data collection circuit.

3. The downhole system of claim **1**, wherein the data collection circuit is further dimensioned and configured to gather and store a first predetermined set of data.

4. The downhole system of claim **3**, wherein the first predetermined set of data are stored in the downhole electronic frac fluid flow control.

5. The downhole system of claim **3**, wherein the first predetermined set of data comprise at least one of pressure data, temperature data, flow data, water cut data, and sleeve position data.

6. The downhole system of claim **1**, wherein the gauge is disposed proximate at least one of the seat or in a separate module in a pup joint assembly deployed in the wellbore.

7. The downhole system of claim **1**, wherein the gauge further comprises:

a. a pressure and temperature gauge;
b. electronics to condition a signal in the gauge;
c. an analog to digital converter;
d. a processor and memory to store data; and
e. an electromagnetic communications system to transfer the data from the gauge to the container.

8. The downhole system of claim **1**, wherein the gauge is disposed either proximate to or as part of the downhole electronic frac fluid flow control module.

9. The downhole system of claim **1**, wherein the downhole electronic frac fluid flow control module is dimensioned and configured to be operated by at least one of (i) a command issued from the surface system or (ii) from the container.

10. The downhole system of claim **1**, wherein the surface system comprises:

a. an electromagnetic communications module dimensioned and configured to communicate with the container; and
b. an interface to a computer.

11. The downhole system of claim **1**, wherein the power source further comprises:

a. a first module, the first module comprising a self-resonant coil dimensioned and adapted to provide a wireless interface to an electromagnetic energy transmission cable which is dimensioned and adapted to be deployed in the wellbore; and
b. a second module operatively in communications with the first module, the second module further comprising its own self-resonant coil to receive energy, the second module located at a predetermined distance from the first module within wellbore.

12. A method of controlling a fluid process in a wellbore, comprising:

a. deploying a controllable downhole electronic frac fluid flow control module to a first predetermined position in a wellbore;
b. deploying a container to a second predetermined position in the wellbore, the container further comprising:
   i. an operational circuit disposed within the container;
   ii. a power source disposed at least partially within the container, the power source operationally in communication with the operational circuit; and
   iii. a container ball and seat;
c. deploying a gauge to a third predetermined position in the wellbore, the gauge dimensioned and configured to gather a first predetermined set of data;
d. deploying a surface system at a surface of the wellbore;
e. establishing communications between the gauge and the operational circuit disposed within the container;
f. establishing communications between the surface system and the operational circuit disposed within the container;
g. issuing a data transmission command from the surface system to the container; and
h. transmitting a predetermined set of data from the container to the surface system upon receipt of the data transmission command from the surface system.

13. The method of claim **12**, further:

a. deploying a gauge module proximate to the downhole electronic frac fluid flow control module;
b. using the gauge to gather a second predetermined set of data; and
c. providing the second predetermined set of data to the surface system upon receipt of a data transmission command from the surface system.

14. The method of claim **13**, further comprising using the gauge to collect data after a frac process for build up tests.

15. The method of claim **12**, wherein the fluid process is at least one of a frac fluid process, a wellbore chemical process, or a monitoring process.

16. The method of claim **12**, further comprising establishing data communications between the downhole electronic frac fluid flow control and a predetermined module deployed in the well via a flexible, non-metallic, substantially continuous tube and connector [slickline, coil tubing, pumping or any other a means used to deploy hardware in the wellbore].

17. The method of claim **13**, wherein:

a. the gauge is deployed without the need for a downhole wired communication connection to the gauge; and
b. the predetermined set of data include data useful for at least one of (i) formation monitoring or (ii) pump optimization.

18. The method of claim **12**, wherein:

a. the gauge is deployed permanently;
b. the container is deployed in the wellbore as part of a drill string and is adapted to interface to a drilling string to retrieve the data from the gauge permanently; and
c. the container collects data wirelessly from the gauge while the drilling string is drilling out the seat from a frac sliding sleeves.

19. A gauge dimensioned and configured for deployment in the wellbore, comprising

a. an electronics module, the electronics module comprising:
  i. a data acquisition module, the data acquisition module dimensioned and configured to measure a predetermined physical phenomenon;
  ii. an analog to digital converter operatively in communication with the data acquisition module;
  iii. a processor operatively in communication with at least one of the data acquisition module or the analog to digital converter;
  iv. a data store operatively in communication with the processor;
  v. a data transmission module operatively in communication with the processor; and
  vi. a gauge signal conditioner operatively in communication with at least one of the data transmission module and the data acquisition module;
b. a self-resonant coil inductively coupled to the electronics module.

20. The gauge of claim **19**, wherein the predetermined physical phenomenon comprises at least one of pressure and temperature.

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