

**A DOWNHOLE TOOL INCLUDING A SWITCH SYSTEM CONFIGURED TO
SWITCH POWER BETWEEN A FIRST DOWNHOLE DEVICE AND A SECOND
DOWNHOLE DEVICE**

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority to U.S. Application Serial No. 18/975,414, filed on December 10, 2024, entitled “A DOWNHOLE TOOL INCLUDING A SWITCH SYSTEM CONFIGURED TO SWITCH POWER BETWEEN A FIRST DOWNHOLE DEVICE AND A SECOND DOWNHOLE DEVICE,” which claims the benefit of U.S. Provisional Application Serial No. 63,609,723, filed on December 13, 2023, entitled “SWITCHING SYSTEM AND METHOD FOR SWITCHING POWER BETWEEN FIRST AND SECOND DOWNHOLE DEVICES,” commonly assigned with this application and incorporated herein by reference in its entirety.

BACKGROUND

[0002] Downhole devices, such as subsurface safety valves (SSSVs) are well known in the oil and gas industry and provide one of many failsafe mechanisms to prevent the uncontrolled release of subsurface production fluids, should a wellbore system experience a loss in containment. In certain instances, SSSVs comprise a portion of a tubing string, the entirety of the SSSVs being set in place during completion of a wellbore. In other instances, the SSSVs are wireline deployed/retrieved. Although a number of design variations are possible for SSSVs, the vast majority are flapper-type valves that open and close in response to longitudinal movement of a flow tube.

[0003] Since SSSVs typically provide a failsafe mechanism, the default positioning of the flapper valve is usually closed in order to minimize the potential for inadvertent release of subsurface production fluids. The flapper valve can be opened through various means of control from the earth's surface in order to provide a flow pathway for production to occur. What is needed in the art is an improved SSSV that does not encounter the problems of existing SSSVs.

BRIEF DESCRIPTION

[0004] Reference is now made to the following descriptions taken in conjunction with the accompanying drawings, in which:

[0005] FIG. 1A illustrates a well system designed, manufactured and/or operated according to one or more embodiments of the disclosure;

[0006] FIGs. 1B and 1C illustrate one embodiment of a switch system designed, manufactured and/or operated according to one or more embodiments of the disclosure, as might be used in the well system of FIG. 1A;

[0007] FIGs. 1D and 1E illustrate an alternative embodiment of a switch system designed, manufactured and/or operated according to one or more embodiments of the disclosure, as might be used in the well system of FIG. 1A;

[0008] FIGs. 1F and 1G illustrate an alternative embodiment of a switch system designed, manufactured and/or operated according to one or more embodiments of the disclosure, as might be used in the well system of FIG. 1A;

[0009] FIGs. 2A through 2D illustrate one embodiment of downhole device, including a safety valve designed, manufactured and/or operated according to one or more embodiments of the disclosure; and

[0010] FIGs. 3A and 3B illustrate one embodiment of a downhole device, including a safety valve designed, manufactured and/or operated according to one or more embodiments of the disclosure.

DETAILED DESCRIPTION

[0011] In the drawings and descriptions that follow, like parts are typically marked throughout the specification and drawings with the same reference numerals, respectively. The drawn figures are not necessarily to scale. Certain features of the disclosure may be shown exaggerated in scale or in somewhat schematic form and some details of certain elements may not be shown in the interest of clarity and conciseness. The present disclosure may be implemented in embodiments of different forms. Specific embodiments are described in detail and are shown in the drawings, with the understanding that the present disclosure is to be considered an exemplification of the principles of the disclosure, and is not intended to limit the disclosure to that illustrated and described herein. It is to be fully recognized that the different teachings of the embodiments discussed herein may be employed separately or in any suitable combination to produce desired results.

[0012] Unless otherwise specified, use of the terms “connect,” “engage,” “couple,” “attach,” or any other like term describing an interaction between elements is not meant to limit the interaction to direct interaction between the elements and may also include indirect interaction between the

elements described. Furthermore, unless otherwise specified, use of the terms “up,” “upper,” “upward,” “uphole,” “upstream,” or other like terms shall be construed as generally toward the surface of the subterranean formation; likewise, use of the terms “down,” “lower,” “downward,” “downhole,” “downstream,” or other like terms shall be construed as generally toward the bottom, terminal end of a well, regardless of the wellbore orientation. Use of any one or more of the foregoing terms shall not be construed as denoting positions along a perfectly vertical axis. Additionally, unless otherwise specified, use of the term “subterranean formation” shall be construed as encompassing both areas below exposed earth and areas below earth covered by water such as ocean or fresh water.

[0013] Various values and/or ranges are explicitly disclosed in certain embodiments herein. However, values/ranges from any lower limit may be combined with any upper limit to recite a range not explicitly recited. Similarly, values/ranges from any lower limit may be combined with any other lower limit to recite a range not explicitly recited. In the same way, values/ranges from any upper limit may be combined with any other upper limit to recite a range not explicitly recited. Additionally, whenever a numerical range with a lower limit and an upper limit is disclosed, any number and any included range falling within the range are specifically disclosed. In particular, every range of values (of the form, “from about a to about b,” or, equivalently, “from approximately a to b,” or, equivalently, “from approximately a-b”) disclosed herein is to be understood to set forth every number and range encompassed within the broader range of values even if not explicitly recited. Thus, every point or individual value may serve as its own lower or upper limit combined with any other point or individual value or any other lower or upper limit, to recite a range not explicitly recited. Similarly, an individual value disclosed herein may be combined with another individual value or range disclosed herein to form another range.

[0014] The term “substantially XYZ,” as used herein, means that it is within 10 percent of perfectly XYZ. The term “significantly XYZ,” as used herein, means that it is within 5 percent of perfectly XYZ. The term “ideally XYZ,” as used herein, means that it is within 1 percent of perfectly XYZ. The monicker “XYZ” could refer to parallel, perpendicular, alignment, or other relative features disclosed herein.

[0015] The present disclosure has acknowledged that offshore wells are being drilled at ever increasing water depths and in environmentally sensitive waters, and thus safety valves (e.g., including subsurface safety valves (SSSVs)) are necessary. The present disclosure has further

acknowledged that SSSVs have inherent problems, and thus from time to time need servicing and/or replacing. In fact, occasionally the tubing retrievable safety valve (TRSV) (e.g., electrically actuated TRSV) will fail, and then a wireline retrievable safety valve (WLRSV) will be run in hole. Unfortunately, each of the TRSV and the WLRSV require their own power source, such as individual tubing encapsulated conductors (TECs).

[0016] The present disclosure has, for the first time, developed a switch system (e.g., mechanical, electrical, etc.) that will allow a single primary electric control line (e.g., single TEC) to operate two different downhole tools, such as the TRSV (e.g., electrically actuated TRSV) and/or WLRSV (e.g., a WLRSV that may be electrically maintained in an open position), or to operate redundant downhole tools, such as a wet connection or an actuator. For example, the switch system could shift power between two different electrical devices (e.g., electromagnetic coils, electric motor or pump, piezoelectric actuator, solenoid valve, etc.) of the two different downhole tools. As another example, the switch system could shift power between an electrical device that has failed to a redundant device that has not been powered. Thus, in at least one embodiment, the single primary electric control line (e.g., single TEC) could be run downhole from the surface to the switch system, and then the switch system would toggle the power between the TRSV and the WLRSV, as necessary. In at least one embodiment, the switch system would toggle the power from the TRSV to the WLRSV as the WLRSV is ready to be run-in-hole, as the WLRSV is being run-in-hole, or after the WLRSV has been run-in-hole.

[0017] Accordingly, a switch system designed, manufactured and/or operated according to one or more embodiments of the disclosure reduces the need to run additional control lines, for example in contingency operations, such as when the TRSV fails and a WLRSV is necessary. This reduces the complexity in running completions, control line protection, tubing hanger penetration, and the overall cost to the customer.

[0018] FIG. 1A illustrates a well system 100 designed, manufactured and/or operated according to one or more embodiments of the disclosure. The well system 100, in at least one embodiment, includes an offshore platform 110 connected to a first downhole device 170 (e.g., first SSSV, such as a TRSV) insert within a wellbore 130 (e.g., the wellbore extending through one or more subterranean formations) and a second downhole device 180 (e.g., second SSSV, such as a WLRSV) insert within the wellbore 130 via a primary control line 120 (e.g., single electrical control line, TEC, etc.). In at least one embodiment, the second downhole device 180 is an

electrical connection for a WLRSV. For example, the electrical connection may be an inductive coupling, a capacitive coupling, or a conductive coupling with direct electrical contact, among others. An annulus 150 may be defined between walls of the wellbore 130 (e.g., extending through a subterranean formation) and a conduit 140. A wellhead 160 may provide a means to hand off and seal conduit 140 against the wellbore 130 and provide a profile to latch a subsea blowout preventer to. Conduit 140 may be coupled to the wellhead 160. Conduit 140 may be any conduit such as a casing, liner, production tubing, or other oilfield tubulars disposed in a wellbore. The first downhole device 170, or at least a portion thereof, may be interconnected with the conduit 140 (e.g., disposed in line with the conduit 140) and positioned in the wellbore 130. The second downhole device 180, or at least a portion thereof, may be interconnected with the conduit 140 (e.g., positioned within an ID or OD of the conduit 140) and positioned in the wellbore 130. In the illustrated embodiment, the second downhole device 180 is illustrated uphole of the first downhole device 170 (e.g., a portion of it being run-in-hole with the first downhole device 170 and another portion of it being run-in-hole after the first downhole device 170 has failed), but other embodiments may exist wherein the second downhole device 180 is located downhole of the first downhole device 170.

[0019] The primary control line 120 may extend into the wellbore 130 and may be connected to the first downhole device 170 and the second downhole device 180. The primary control line 120 may provide actuation power to the first downhole device 170 and the second downhole device 180. As will be described in further detail below, power may be provided to first downhole device 170 or the second downhole device 180 to actuate or de-actuate the first downhole device 170 or the second downhole device 180. Actuation may comprise opening the first downhole device 170 or the second downhole device 180 to provide a flow path for subsurface production fluids to enter conduit 140, and de-actuation may comprise closing the first downhole device 170 or the second downhole device 180 to close a flow path for subsurface production fluids to enter conduit 140. While the embodiment of FIG. 1A illustrates only the first downhole device 170 and the second downhole device 180, other embodiments exist wherein more than two downhole devices according to the disclosure are used.

[0020] In accordance with one embodiment of the disclosure, the well system 100 may further include a switch system 190a positioned between the primary control line 120 and each of the first downhole device 170 and the second downhole device 180. The switch system 190a, as discussed

above, is configured to switch the incoming power from the primary control line 120 between the first downhole device 170 and the second downhole device 180, depending on which of the first downhole device 170 or the second downhole device 180 that the operator intends to operate (e.g., actuate). In at least one embodiment, the first downhole device 170 includes a first electrical device (e.g., electromagnetic coils, electric motor or pump, piezoelectric actuator, solenoid valve, etc.) and the second downhole device 180 includes a second electrical device (e.g., electromagnetic coils, electric motor or pump, piezoelectric actuator, solenoid valve, etc.), and the switch system 190a is configured to switch the incoming power from the primary control line 120 between the first electrical device of the first downhole device 170 and the second electrical device of the second downhole device 180. Although the well system 100 is depicted in FIG. 1A as an offshore well system, one of ordinary skill should be able to adapt the teachings herein to any type of well, including onshore or offshore.

[0021] Turning to FIGs. 1B and 1C, illustrated is one embodiment of a switch system 190b designed, manufactured and/or operated according to one or more embodiments of the disclosure, as might be used in the well system 100 of FIG. 1A. The switch system 190b, in the illustrated embodiment, is a mechanical switch system. In the illustrated embodiment, the switch system 190b includes a mechanically activated switch 191, the mechanically activated switch 191 having an input thereof coupled to the primary control line 120, and a first output thereof coupled to the first downhole device 170 and a second output thereof coupled to the second downhole device 180. Accordingly, the mechanically activated switch 191 switches the input power from the primary control line 120 between the first downhole device 170 (e.g., FIG. 1B) and the second downhole device 180 (FIG. 1C), as necessary.

[0022] While a number of different embodiments for mechanical switch systems may be used, in the illustrated embodiment, a sliding sleeve 172 of the first downhole device 170 includes a permanent magnet 174 thereon. Similarly, the switch system 190b includes a related permanent magnet 192 therein, for example coupled to the mechanically activated switch 191 (e.g., two or more magnetic features). Furthermore, the switch system 190b may include an insulator 193 separating the first output and the second output. Accordingly, the related permanent magnet 192 will couple with (e.g., decouple from) the permanent magnet 174 to switch the power between the first downhole device 170 and the second downhole device 180, in this instance as the sliding sleeve 172 moves, as shown in FIGs. 1B and 1C. In at least one embodiment, the sliding sleeve

172 is configured to move when the second downhole device 180 is being run-in-hole. Again, while one or more permanent magnets 174 are illustrated in FIGs. 1B and 1C for shifting the switch, in one or more other embodiments the switches are directly shifted as opposed to magnetically shifted.

[0023] While not illustrated in FIGs. 1B and 1C, another embodiment may exist wherein a reed switch is employed to switch between the first downhole device 170 and the second downhole device 180. In such an embodiment, one or more of the permanent magnets 192 could be exchanged for a reed switch. Thus, as the permanent magnet 174 passes over the reed switch, the reed switch will switch the power between the first downhole device 170 and the second downhole device 180. In at least one embodiment, ones of the one or more reed switches are single pole single-throw reed switches and/or single pole double-throw reed switches. Those skilled in the art appreciate how such reed switches would be configured to achieve the desires stated herein.

[0024] Turning to FIGs. 1D and 1E, illustrated is one embodiment of a switch system 190d designed, manufactured and/or operated according to one or more embodiments of the disclosure, as might be used in the well system 100 of FIG. 1A. The switch system 190d, in the illustrated embodiment, is an electrical switch system, for example including an electrically activated switch. In the illustrated embodiment, the switch system 190d includes two or more oppositely oriented diodes 195a, 195b coupled between the primary control line 120 and each of the first downhole device 170 and the second downhole device 180, respectively. Thus, for example, if a positive voltage is applied to the primary control line 120, the first diode 195a would allow the current 197 to pass therethrough and thus would establish a closed circuit, and therefore the first downhole tool 170 would be powered. However, the second diode 195b would not allow the current 197 to pass there through and thus would establish an open circuit, and thus the second downhole device 180 would not be powered. In contrast, if a negative voltage is applied to the primary control line 120, the first diode 195a would not allow the current 197 to pass therethrough and thus would establish an open circuit, and therefore the first downhole device 170 would not be powered. However, the second diode 195b would allow the current 197 to pass therethrough and thus would establish a closed circuit, and thus the second downhole device 180 would be powered. Thus, by toggling the voltage between a positive voltage (e.g., preset positive voltage) and a negative voltage (e.g., preset negative voltage), the switch system 190c powers different ones of the first downhole device 170 and the second downhole device 180.

[0025] Turning to FIGs. 1F and 1G, illustrated is one embodiment of a switch system 190f designed, manufactured and/or operated according to one or more embodiments of the disclosure, as might be used in the well system 100 of FIG. 1A. The switch system 190f contains a magnetically activated switch 198. In one embodiment, the magnetically activated switch 198 is a reed switch, as shown in FIGs. 1F and 1G. When there is no magnetic field being subjected to the magnetically activated switch 198, such as shown in FIG. 1F, then the contact 199 in the reed switch is biased (e.g., inherently biased) towards an electrical connection with the first downhole device 170, and thus power (e.g., electrical current) can flow to that tool. When there is a magnetic field being subjected to the magnetically activated switch 198, such as shown in FIG. 1G, then the contact 199 in the reed switch is biased (e.g., mechanically biased) towards an electrical connection with the second downhole device 180, and thus power (e.g., electrical current) can flow to that tool. For example, in FIG. 1 the permanent magnet 174 creates a magnetic attraction that pulls the contact 199 towards an electrical connection with the second downhole device 180 and thus power (e.g., electrical current) can flow to that tool. The magnetically activated switch 198 can employ first and second reed switches rather than the double throw switch that is shown, wherein the second reed switch is configured to work in conjunction with the first reed switch to switch power between the primary control line and the first downhole device and the primary control line and the second downhole device. One of the advantages of the reed switch is that it is a mechanically activated switch and contains no electronics. As an alternative embodiment, the magnetically activated switch 198 could be a tunnel magneto-resistance (TMR) switch. A TMR switch contains a magnetic tunnel junction where the resistance of the junction varies with magnetic field. The TMR switch varies between high resistance (open switch) and low resistance (closed switch) with applied magnetic field.

[0026] Turning to FIGs. 2A through 2D, illustrated are different views of a downhole device, including a safety valve 200 designed, manufactured and/or operated according to one or more embodiments of the disclosure during different operational states. In the illustrated embodiment of FIGs. 2A through 2C, the safety valve 200 is a subsurface safety valve (SSSV). Nevertheless, other types of safety valves may be used and remain within the scope of the disclosure.

[0027] FIG. 2A illustrates the safety valve 200 in a first closed position, its unpowered electromagnetic assembly and magnetic target decoupled from one another. FIG. 2B illustrates the safety valve 200 of FIG. 2A with power (DC power in this embodiment) supplied to the

electromagnetic assembly. FIG. 2C illustrates the safety valve 200 of FIG. 2B now in an open position, the powered (DC powered) electromagnetic assembly and magnetic target magnetically coupled (e.g., fixedly coupled) with one another. FIG. 2D illustrates the safety valve 200 of FIG. 2C after power (DC power) has been cut to the electromagnetic assembly, and thus the safety valve 200 returns to the first closed position.

[0028] Referring to FIG. 2A, the safety valve 200 is illustrated in a first closed position. The safety valve 200, in one or more embodiments, may include an outer housing 224 containing a central bore 225 therein, wherein components of the safety valve 200 may be disposed within the central bore 225. An upper valve assembly 234 (e.g., also the magnetic target in this embodiment) may be attached to the outer housing 224, and may further include one or more sealing elements 223, such that fluid communication from a lower section 202 to an upper section 203 is prevented.

[0029] A sleeve 226 may be attached to the upper valve assembly 234 and a lower valve assembly 216. A bore flow management actuator 240 may be disposed within the sleeve 226. The bore flow management actuator 240 may include a translating sleeve 222 and a flow tube main body 208. A flow path 214 may be defined by an interior of the flow tube main body 208. As illustrated in FIG. 2A, the flow path 214 may extend from an interior of a conduit 206 through an interior of the flow tube main body 208. As will be discussed in further detail below, when the safety valve 200 is in an open position, the flow path 214 may extend from an interior of the conduit 206 through an interior of the flow tube main body 208 and further into the lower section 202.

[0030] The safety valve 200 may further include a power spring 210 disposed between the lower valve assembly 216 and a translating sleeve shoulder 218. As illustrated in FIG. 2A, the translating sleeve shoulder 218 and a flow tube shoulder 232 may be in contact when the safety valve 200 is in the first closed position. The power spring 210 may provide a positive spring force against the translating sleeve shoulder 218, which may keep the flow tube main body 208 in a first position. The power spring 210 may also provide a positive spring force to return the flow tube main body 208 and the translating sleeve 222 to the first position (e.g., from a second position), as will be explained below.

[0031] The safety valve 200 may further include a nose spring 212 disposed between a translating sleeve assembly 230 and the flow tube shoulder 232. The translating sleeve assembly 230 may be disposed between and attached to a piston 220 and the translating sleeve 222. The power spring 210 and the nose spring 212 are depicted as coil springs in FIGS. 2A through 2D. However, the

power spring 210 and the nose spring 212 may comprise any kind of spring and remain within the scope of the present disclosure, such as, for example, coil springs, wave springs, or fluid springs, among others.

[0032] In the illustrated embodiment, the translating sleeve assembly 230 may allow a force applied to a distal end of the piston 220 to be transferred into the translating sleeve 222. A force may be applied to the distal end of the piston 220 by way of fluid communication from a channel 228 through an orifice 242. A force applied to the piston 220 may move the translating sleeve 222 from a first position to a second position. The nose spring 212 may provide a positive spring force against the translating sleeve assembly 230 and the flow tube shoulder 232, which may return the translating sleeve 222 from the second position to the first position, as will be discussed in greater detail below.

[0033] In the first closed position, the translating sleeve 222 and the flow tube main body 208 are positioned such that the translating sleeve shoulder 218 and the flow tube shoulder 232 are in contact and the power spring 210 and the nose spring 212 are in an extended position. In the first closed position, the translating sleeve 222 may be referred to as being in a first position and the flow tube main body 208 may be referred to as being in a first position.

[0034] In the first closed position, a valve closure mechanism 204 may be in a closed position, thereby isolating the lower section 202 from the flow tube main body 208. When the valve closure mechanism 204 is in a closed position, as in FIG. 2A, the valve closure mechanism 204 may prevent formation fluids and pressure from flowing into the flow tube main body 208 from the lower section 202. Although FIG. 2A illustrates the valve closure mechanism 204 as a flapper valve, the valve closure mechanism 204 may be any suitable type of valve such as a flapper type valve or a ball type valve, for example. As will be illustrated in further detail below, the valve closure mechanism 204 may be actuated into an open position to allow formation fluids to flow from the lower section 202 through the flow path 214 (e.g., defined by the lower section 202, an interior of the flow tube main body 208 and an interior of the conduit 206).

[0035] When the safety valve 200 is in the first closed position, no amount of differential pressure across the valve closure mechanism 204 will allow formation fluids to flow from the lower section 202 into the flow path 214. In the first closed position, the safety valve 200 will only allow fluid flow from conduit 206 into the lower section 202, but not from the lower section 202 into the conduit 206. In the instance that pressure in the conduit 206 is increased, the valve closure

mechanism 204 will remain in the closed position until the pressure in the conduit 206 is increased above the pressure in the lower section 202 plus the closing pressure provided by the valve closure mechanism spring 205, sometimes referred to herein as valve opening pressure. When the valve opening pressure is reached, the valve closure mechanism 204 may open and allow fluid communication from the conduit 206 into the lower section 202. In this manner, treatment fluids such as surfactants, scale inhibitors, hydrate treatments, and other suitable treatment fluids may be introduced into the subterranean formation. The configuration of the safety valve 200 may allow treatment fluids to be pumped from a surface, such as a wellhead, into the subterranean formation without actuating a control line or balance line to open the valve. Once pressure in the conduit 206 is decreased below the valve opening pressure, the valve closure mechanism spring 205 will return the valve closure mechanism 204 to the closed position, and thus flow from the conduit 206 into the lower section 202 will cease. When the valve closure mechanism 204 has returned to the closed position, flow from the lower section 202 into the flow path 214 will be prevented. Should a pressure differential across the valve closure mechanism 204 be reversed, such that pressure in the lower section 202 is greater than a pressure in the conduit 206, the valve closure mechanism 204 will remain in a closed position, such that fluids in the lower section 202 are prevented from flowing into the conduit 206.

[0036] The safety valve 200, in the illustrated embodiment, additionally includes an electromagnetic assembly 238. In the illustrated embodiment, the electromagnetic assembly 238 is electrically coupled to a power source via an electrical connection, such as a tubing encapsulated conductor (TEC). In the illustrated embodiment, the power source is a DC power source configured to deliver a constant voltage, as well as a DC current.

[0037] Turning now to FIG. 2B, power (DC power) has now been delivered to the electromagnetic assembly 238 via the power source. In at least one embodiment, it is important that the power be delivered to the electromagnetic assembly 238 prior to the electromagnetic assembly 238 and magnetic target coming into contact with one another. In at least one other embodiment, it is important that the power be delivered to the electromagnetic assembly 238 after the electromagnetic assembly 238 and magnetic target coming into contact with one another.

[0038] With continued reference to FIG. 2B, the safety valve 200 is illustrated in a second closed position. In the second closed position, the translating sleeve 222 may be displaced from the first position to a second position, which is relatively closer in proximity to the valve closure

mechanism 204. The flow tube main body 208 may, however, remain in the first position or slightly downhole from the first position (e.g., as shown). When the safety valve 200 is in the second closed position, both the power spring 210 and the nose spring 212 may be in a compressed state.

[0039] To move the translating sleeve 222 to the second position, differential pressure across the valve closure mechanism 204 may be increased by lowering pressure in the conduit 206 or increasing pressure in the lower section 202. Lowering pressure in the conduit 206 or increasing pressure in the lower section 202 will cause fluid from the lower section 202 to flow through the channel 228 defined between the sleeve 226 and the outer housing 224 into the orifice 242. The orifice 242 may allow fluid communication into a piston tube 244, whereby the fluid pressure may act on the proximal end of the piston 220. The force exerted by the fluid pressure on the proximal end of the piston 220 may displace the piston 220 towards the valve closure mechanism 204, by transferring the force through the piston 220, the translating sleeve assembly 230, and the translating sleeve shoulder 218.

[0040] The nose spring 212 may provide a spring force against the flow tube shoulder 232 and the translating sleeve assembly 230, and the power spring 210 may provide a spring force against the translating sleeve shoulder 218 and the lower valve assembly 216. Although not illustrated in FIGs. 2A through 2D, the flow tube main body 208 may include channels that allow pressure and/or fluid communication between the flow path 214 and an interior of the sleeve 226. Collectively the spring forces from the power spring 210 and the nose spring 212 may resist the movement of the piston 220 until the differential pressure across the valve closure mechanism 204 is increased beyond the spring force provided from the power spring 210 and the nose spring 212. Increasing the differential pressure may include decreasing pressure in the flow tube main body 208, such that pressure in the lower section 202 is relatively higher than the pressure in the flow tube main body 208. When the differential pressure across the valve closure mechanism 204 is increased, the differential pressure across the piston 220 also increases. When the differential pressure across the valve closure mechanism 204 is increased beyond the spring force provided by the nose spring 212 and the power spring 210, the nose spring 212 and the power spring 210 may compress and allow the translating sleeve 222 to move into the second position. Differential pressure across the valve closure mechanism 204 may be increased by pumping fluid out of the conduit 206, for example. In the instance that the lower section 202 is fluidically coupled to a non-

perforated section of pipe or where there is a plug in a conduit fluidically coupled to the lower section 202 that prevents pressure being transmitted from the lower section 202 to the piston 220, a pressure differential across the valve closure mechanism 204 may be induced through pipe swell.

[0041] In the second closed position, the safety valve 200 remains safe as no fluids from the lower section 202 can flow into the flow path 214. In the second closed position, no amount of differential pressure across the valve closure mechanism 204, the differential pressure being relatively higher pressure in the lower section 202 and relatively lower pressure in the conduit 206, should cause the valve closure mechanism 204 to open to allow fluids from the lower section 202 to flow into the flow path 214, as the pressure from the lower section 202 is acting on the valve closure mechanism 204. Unlike conventional safety valves, which generally require a control line to supply pressure to actuate a piston to move a translating sleeve, the safety valve 200 only requires pressure supplied by the wellbore fluids in the lower section 202 to move the translating sleeve.

[0042] With continued reference to FIG. 2B, a piston 236 may be fixedly attached to the translating sleeve assembly 230 and the electromagnetic assembly 238. Although illustrated as two pistons in FIGS. 2A through 2F, the piston 236 may be an integral component of the piston 220. As illustrated, when the translating sleeve 222 is moved from the first position to the second position, the piston 236 and the electromagnetic assembly 238 may also be moved, such that the electromagnetic assembly 238 is now in physical contact with the upper valve assembly 234 (e.g., which acts as the magnetic target). As the electromagnetic assembly 238 is attached to the translating sleeve assembly 230 through the piston 236, when the electromagnetic assembly 238 is switched on and fixed in place (e.g., like that shown in FIG. 2B), the translating sleeve assembly 230 and the translating sleeve 222 will also become fixed in place, thereby preventing the translating sleeve 222 from moving from the second position back to the first position, regardless of changes to the differential pressure across the valve closure mechanism 204. Advantageously, the electromagnetic assembly 238 may provide a means to hold the translating sleeve 222 at any well depth.

[0043] In FIGS. 2A through 2D, the electromagnetic assembly 238 is depicted as one coil circumscribing the translating sleeve assembly 230, but there may be any number of coils in any orientation to fix the translating sleeve assembly 230 in place. The electromagnetic assembly 238 may apply a force in a substantially axial direction, for example. The force applied by the

electromagnetic assembly 238 may be any amount of force, including but not limited to, a force in a range of about 45 Newtons to about 45000 Newtons.

[0044] Hydraulic systems used in previous wellbore safety valves generally require control and balance lines to actuate and hold a valve open, which may have pressure limitations. The limitations experienced by the hydraulic systems may be overcome by using the electromagnetic assembly 238 described herein, as only well pressure is required to open the safety valve 200. Again, when the translating sleeve 222 is in the second position, either when the electromagnetic assembly 238 is switched on or switched off, no amount of differential pressure across the valve closure mechanism 204 will open the valve closure mechanism 204, the differential pressure being a pressure difference between a relatively higher pressure in the lower section 202 and a relatively lower pressure in the conduit 206.

[0045] With reference to FIG. 2C, the safety valve 200 is illustrated in an open position. When the safety valve 200 is in the open position, the translating sleeve 222 may be fixed in place in the second position (e.g., as shown in FIG. 2B) through the force provided by the electromagnetic assembly 238, the force being transferred through the piston 236 to the translating sleeve assembly 230. The flow tube main body 208 is illustrated as being axially shifted from the first position illustrated in FIGs. 2A and 2B, to a second position in FIG. 2C. When the flow tube main body 208 is in the second position, the flow tube shoulder 232 and the translating sleeve shoulder 218 may be in contact, and the flow tube main body 208 may have displaced the valve closure mechanism 204 into an open position. Additionally, the nose spring 212 may be in an uncompressed state while the power spring 210 may be in a compressed state.

[0046] The flow tube main body 208 may be moved from the first position to the second position when the translating sleeve 222 is fixed in place in the second position by the electromagnetic assembly 238, as described above. When the translating sleeve 222 is fixed in the second position through the force provided by the electromagnetic assembly 238, the nose spring 212 may provide a positive spring force against the flow tube shoulder 232 and the translating sleeve assembly 230. The positive spring force from the nose spring 212 may be transferred through the flow tube main body 208 into the valve closure mechanism 204. The flow tube main body 208 will not move to the second position until differential pressure across the valve closure mechanism 204 is decreased and the translating sleeve 222 is fixed in position. Differential pressure may be decreased by pumping into the conduit 206, thereby increasing the pressure in the conduit 206. Pressure may be

increased in the conduit 206 until the differential pressure across the valve closure mechanism 204 is decreased to a point where the positive spring force from the nose spring 212 is greater than the differential pressure across the valve closure mechanism 204. Thereafter, the nose spring 212 may extend and move the flow tube main body 208 into the second position by acting on the translating sleeve assembly 230 and the flow tube shoulder 232. When the flow tube main body 208 is in the second position, fluids such as oil and gas in the lower section 202 may be able to flow into the flow path 214 and to a surface of the wellbore, such as to a wellhead. The safety valve 200 may remain in the open position, defined by the translating sleeve 222 being in the second position and the flow tube main body 208 being in the second position, as long as the electromagnetic assembly 238 remains powered on.

[0047] With reference to FIG. 2D, the safety valve 200 may be moved back to the first closed position by cutting power to the electromagnetic assembly 238. In yet another embodiment, the safety valve 200 may be indirectly moved back to the first closed position, for example if an electrical logic circuit determines that the electrical power has been interrupted and initiates a closing of the safety valve 200. As previously discussed, the electromagnetic assembly 238 may fix the translating sleeve assembly 230 in place in the second position when the electromagnetic assembly 238 remains powered on. When electromagnetic assembly 238 is powered off, the translating sleeve assembly 230 may no longer be fixed in place. The power spring 210 may provide a positive spring force against the lower valve assembly 216, the translating sleeve shoulder 218, and the flow tube shoulder 232 through contact between the translating sleeve shoulder 218 and the flow tube shoulder 232. The positive spring force from the power spring 210 may axially displace the translating sleeve 222 to the first position and the flow tube main body 208 to the first position, thereby returning the safety valve 200 to the first closed position illustrated in FIG. 2D. The positive spring force from the power spring 210 may axially displace the electromagnetic assembly 238 to the position illustrated in FIG. 2D by transmitting the positive spring force through the piston 236. The valve closure mechanism spring 205 may then return the valve closure mechanism 204 to the closed position shown in FIG. 2D.

[0048] Turning to FIGS. 3A and 3B, illustrated is one embodiment of downhole device, including a safety valve 300 designed, manufactured and/or operated according to one or more embodiments of the disclosure. FIG. 3A illustrates the safety valve 300 in a closed state, whereas FIG. 3B illustrates the safety valve 300 in an open state. The safety valve 300, in the illustrated

embodiment, includes an outer housing 310 including a central bore 315 extending axially through the outer housing 310. The central bore 315, in the illustrated embodiment, is operable to convey subsurface production fluids there through, and thus up to a surface of a wellbore.

[0049] The safety valve 300, in the illustrated embodiment, further includes a spring housing 320. The spring housing 320, in one or more embodiments, includes a bore 325. Positioned in the bore 325, in the illustrated embodiment, is a spring 330. In at least one embodiment, not shown, the outer housing 310 and the spring housing 320 are a single unitary housing. However, in other embodiments, such as shown, the outer housing 310 and the spring housing 320 are separate but connected housings.

[0050] The safety valve 300, in the illustrated embodiment, further includes a valve closure mechanism 340 coupled to the outer housing 310 within the central bore 315. The valve closure mechanism 340 may take various different types and/or shapes. Nevertheless, in the embodiment of FIGs. 3A and 3B the valve closure mechanism 340 is a flapper type valve closure mechanism. In at least one embodiment, the valve closure mechanism 340 includes a valve closure mechanism spring 345 configured to bias the valve closure mechanism 340 from its open state (e.g., as shown in FIG. 3B) toward its closed state (e.g., as shown in FIG. 3A).

[0051] The safety valve 300, in the illustrated embodiment, additionally includes a bore flow management actuator 350 disposed in the central bore 315. In one or more embodiments, the bore flow management actuator 350 is configured to slide from a first initial state (e.g., as shown in FIG. 3A) to a first subsequent state (e.g., as shown in FIG. 3B) to move (e.g., prop) the valve closure mechanism 340 between the closed state (e.g., as shown in FIG. 3A) and the open state (e.g., as shown in FIG. 3B). The bore flow management actuator 350, in the illustrated embodiment, is coupled to the spring 330. Accordingly, the spring 330 may be used to return the bore flow management actuator 350 to the first state (and thus allow the valve closure mechanism 340 to return to its closed state).

[0052] While not shown in the view of FIGs. 3A and 3B, the downhole device may include ones of an electromagnetic assembly and a permanent magnet/ferromagnet for operating the bore flow management actuator 350. For example, in at least one embodiment, the permanent magnet/ferromagnet is physically coupled to the bore flow management actuator 350, wherein the electromagnetic assembly is magnetically coupled to the permanent magnet/ferromagnet. Thus, when the electromagnetic assembly is powered (e.g., as discussed above), any movement of the

electromagnetic assembly will also move the permanent magnet/ferromagnet, and thus move the bore flow management actuator 350.

[0053] In the embodiment of FIGs. 3A and 3B, the electromagnetic assembly includes a single discrete electromagnet. Similarly, the permanent magnet/ferromagnet is a single discrete permanent magnet/ferromagnet. In such embodiments, the single discrete electromagnet and the single discrete permanent magnet/ferromagnet should at least partially radially align.

[0054] The safety valve 300, in one or more embodiments, may include a primary control system 380. The primary control system 380, in the illustrated embodiment, is configured to slide the bore flow management actuator 350 from the first state (e.g., as shown in FIG. 3A) to the second state (e.g., as shown in FIG. 3B) when the primary control system 380 receives a primary signal from a primary control line.

[0055] It should be noted that the safety valves 200, 300 of FIGs. 2A through 3B, along with any currently known or hereafter discovered safety valve, may be used with any embodiment of a switch system disclosed herein. Accordingly, the present disclosure should not be limited to the specific embodiments of the safety valves 200, 300 of FIGs. 2A through 3B.

[0056] Aspects disclosed herein include:

A. A downhole tool, the downhole device including: 1) a first downhole device, the first downhole device including a first outer housing including a first central bore extending axially through the first outer housing, the first central bore operable to convey subsurface production fluids there through; and 2) a switch system, the switch system including: a) an input coupled to a primary electric control line; b) a first output coupled to a first electrical component of the first downhole device; and c) a second output coupleable to a second electrical component of a second downhole device, the switch system configured to switch power between the primary electric control line and the first downhole device and the primary electric control line and the second downhole device.

B. A well system, the well system including: 1) a wellbore extending through one or more subterranean formations; 2) production tubing disposed in the wellbore; 3) a first downhole device disposed in line with the production tubing, the first downhole device including a first outer housing including a first central bore extending axially through the first outer housing, the first central bore operable to convey subsurface production fluids there through; 4) a second downhole device disposed within the wellbore, the second downhole device including a second outer housing

including a second central bore extending axially through the second outer housing, the second central bore operable to convey subsurface production fluids there through; and 5) a switch system, the switch system including: a) an input coupled to a primary electric control line; b) a first output coupled to a first electrical component of the first downhole device; and c) a second output coupled to a second electrical component of the second downhole device, the switch system configured to switch power between the primary electric control line and the first downhole device and the primary electric control line and the second downhole device.

C. A method, the method including: 1) positioning a first downhole device disposed in line with production tubing located in a wellbore, the first downhole device including a first outer housing including a first central bore extending axially through the first outer housing, the first central bore operable to convey subsurface production fluids there through; 2) positioning a second downhole device in the wellbore, the second downhole device including a second outer housing including a second central bore extending axially through the second outer housing, the second central bore operable to convey subsurface production fluids there through, wherein a switch system is coupled with the first and second downhole devices, the switch system including: a) an input coupled to a primary electric control line; b) a first output coupled to a first electrical component of the first downhole device; and c) a second output coupled to a second electrical component of the second downhole device, the switch system configured to switch power between the primary electric control line and the first downhole device and the primary electric control line and the second downhole device; and 3) switching a signal from the primary electric control line between the first and second downhole devices.

[0057] Aspects A, B, and C may have one or more of the following additional elements in combination: Element 1: wherein the first downhole device further includes a first valve closure mechanism coupled to the first outer housing within the first central bore, and a first bore flow management actuator disposed in the first central bore, the first bore flow management actuator configured to slide from a first initial state to a first subsequent state to move the first valve closure mechanism between a first closed state and a first open state. Element 2: wherein the switch system is a mechanical switch system that includes a mechanically activated switch configured to switch power between the primary electric control line and the first downhole device and the primary electric control line and the second downhole device. Element 3: wherein the mechanically activated switch includes two or more magnetic features, the two or more magnetic features

configured to move to switch power between the primary electric control line and the first downhole device and the primary electric control line and the second downhole device. Element 4: wherein at least one of the two or more magnetic features is coupled to a sliding sleeve of the first downhole device, and further wherein as the one of the two or more magnetic features slides with the sliding sleeve, an other of the two or more magnetic features magnetically coupled with the one of the two or more magnetic features moves to switch power between the primary electric control line and the first downhole device and the primary electric control line and the second downhole device. Element 5: wherein the other of the two or more magnetic features is configured to move between a first position forming a first closed circuit with the first downhole device and forming a first open circuit with the second downhole device and a second position forming a second open circuit with the first downhole device and forming a second closed circuit with the second downhole device. Element 6: further including an insulator separating the first output and the second output. Element 7: wherein the mechanically activated switch includes a reed switch. Element 8: wherein the reed switch is a double throw reed switch. Element 9: wherein the reed switch is a first reed switch, and further including a second reed switch configured to work in conjunction with the first reed switch to switch power between the primary electric control line and the first downhole device and the primary electric control line and the second downhole device. Element 10: wherein the mechanically activated switch includes a tunnel magneto-resistance (TMR) switch. Element 11: wherein the switch system is an electrical switch system that includes an electrically activated switch configured to switch power between the primary electric control line and the first downhole device and the primary electric control line and the second downhole device. Element 12: wherein the electrically activated switch includes two or more oppositely oriented diodes, the two or more oppositely oriented diodes configured to switch power between the primary electric control line and the first downhole device and the primary electric control line and the second downhole device. Element 13: wherein a first of the two or more oppositely oriented diodes is configured to form a first closed circuit with the first downhole device and a first open circuit with the second downhole device when receiving a positive voltage, and a second of the two or more oppositely oriented diodes is configured to form a second open circuit with the first downhole device and a second closed circuit with the second downhole device when receiving a negative voltage. Element 14: wherein the first downhole device is a tubing retrievable safety valve (TRSV) and the second downhole device is a wireline retrievable safety valve (WLRSV).

Element 15: wherein the switch system is configured to switch power between the primary electric control line and the tubing retrievable safety valve (TRSV) and the primary electric control line and the wireline retrievable safety valve (WLRSV) before the wireline retrievable safety valve (WLRSV) is insert within a wellbore. Element 16: wherein the switch system is configured to switch power between the primary electric control line and the tubing retrievable safety valve (TRSV) and the primary electric control line and the wireline retrievable safety valve (WLRSV) as the wireline retrievable safety valve (WLRSV) is being insert within a wellbore. Element 17: wherein the switch system is configured to switch power between the primary electric control line and the tubing retrievable safety valve (TRSV) and the primary electric control line and the wireline retrievable safety valve (WLRSV) after the wireline retrievable safety valve (WLRSV) is insert within a wellbore. Element 18: wherein the first electrical component of the first downhole device is a first electromagnetic assembly. Element 19: wherein the second electrical component of the second downhole device is a second electromagnetic assembly. Element 20: wherein the first electrical component is an electric motor or pump, a piezoelectric actuator, or a solenoid valve. [0058] Those skilled in the art to which this application relates will appreciate that other and further additions, deletions, substitutions and modifications may be made to the described embodiments.

WHAT IS CLAIMED IS:

1. A downhole tool, comprising:
 - a first downhole device, the first downhole device including a first outer housing including a first central bore extending axially through the first outer housing, the first central bore operable to convey subsurface production fluids there through; and
 - a switch system, the switch system including:
 - an input coupled to a primary electric control line;
 - a first output coupled to a first electrical component of the first downhole device; and
 - a second output coupleable to a second electrical component of a second downhole device, the switch system configured to switch power between the primary electric control line and the first downhole device and the primary electric control line and the second downhole device.
2. The downhole tool as recited in Claim 1, wherein the first downhole device further includes a first valve closure mechanism coupled to the first outer housing within the first central bore, and a first bore flow management actuator disposed in the first central bore, the first bore flow management actuator configured to slide from a first initial state to a first subsequent state to move the first valve closure mechanism between a first closed state and a first open state.
3. The downhole tool as recited in Claim 1, wherein the switch system is a mechanical switch system that includes a mechanically activated switch configured to switch power between the primary electric control line and the first downhole device and the primary electric control line and the second downhole device.
4. The downhole tool as recited in Claim 3, wherein the mechanically activated switch includes two or more magnetic features, the two or more magnetic features configured to move to switch power between the primary electric control line and the first downhole device and the primary electric control line and the second downhole device.

5. The downhole tool as recited in Claim 4, wherein at least one of the two or more magnetic features is coupled to a sliding sleeve of the first downhole device, and further wherein as the one of the two or more magnetic features slides with the sliding sleeve, an other of the two or more magnetic features magnetically coupled with the one of the two or more magnetic features moves to switch power between the primary electric control line and the first downhole device and the primary electric control line and the second downhole device.

6. The downhole tool as recited in Claim 5, wherein the other of the two or more magnetic features is configured to move between a first position forming a first closed circuit with the first downhole device and forming a first open circuit with the second downhole device and a second position forming a second open circuit with the first downhole device and forming a second closed circuit with the second downhole device.

7. The downhole tool as recited in Claim 6, further including an insulator separating the first output and the second output.

8. The downhole tool as recited in Claim 3, wherein the mechanically activated switch includes a reed switch.

9. The downhole tool as recited in Claim 8, wherein the reed switch is a double throw reed switch.

10. The downhole tool as recited in Claim 8, wherein the reed switch is a first reed switch, and further including a second reed switch configured to work in conjunction with the first reed switch to switch power between the primary electric control line and the first downhole device and the primary electric control line and the second downhole device.

11. The downhole tool as recited in Claim 3, wherein the mechanically activated switch includes a tunnel magneto-resistance (TMR) switch.

12. The downhole tool as recited in Claim 1, wherein the switch system is an electrical switch system that includes an electrically activated switch configured to switch power between the primary electric control line and the first downhole device and the primary electric control line and the second downhole device.

13. The downhole tool as recited in Claim 12, wherein the electrically activated switch includes two or more oppositely oriented diodes, the two or more oppositely oriented diodes configured to switch power between the primary electric control line and the first downhole device and the primary electric control line and the second downhole device.

14. The downhole tool as recited in Claim 13, wherein a first of the two or more oppositely oriented diodes is configured to form a first closed circuit with the first downhole device and a first open circuit with the second downhole device when receiving a positive voltage, and a second of the two or more oppositely oriented diodes is configured to form a second open circuit with the first downhole device and a second closed circuit with the second downhole device when receiving a negative voltage.

15. The downhole tool as recited in Claim 1, wherein the first downhole device is a tubing retrievable safety valve (TRSV) and the second downhole device is a wireline retrievable safety valve (WLRSV).

16. The downhole tool as recited in Claim 15, wherein the switch system is configured to switch power between the primary electric control line and the tubing retrievable safety valve (TRSV) and the primary electric control line and the wireline retrievable safety valve (WLRSV) before the wireline retrievable safety valve (WLRSV) is insert within a wellbore.

17. The downhole tool as recited in Claim 15, wherein the switch system is configured to switch power between the primary electric control line and the tubing retrievable safety valve (TRSV) and the primary electric control line and the wireline retrievable safety valve (WLRSV) as the wireline retrievable safety valve (WLRSV) is being insert within a wellbore.

18. The downhole tool as recited in Claim 15, wherein the switch system is configured to switch power between the primary electric control line and the tubing retrievable safety valve (TRSV) and the primary electric control line and the wireline retrievable safety valve (WLRSV) after the wireline retrievable safety valve (WLRSV) is insert within a wellbore.

19. The downhole tool as recited in Claim 1, wherein the first electrical component of the first downhole device is a first electromagnetic assembly.

20. The downhole tool as recited in Claim 19, wherein the second electrical component of the second downhole device is a second electromagnetic assembly.

21. The downhole tool as recited in Claim 1, wherein the first electrical component is an electric motor or pump, a piezoelectric actuator, or a solenoid valve.

22. A well system, comprising:

a wellbore extending through one or more subterranean formations;

production tubing disposed in the wellbore;

a first downhole device disposed in line with the production tubing, the first downhole device including a first outer housing including a first central bore extending axially through the first outer housing, the first central bore operable to convey subsurface production fluids there through;

a second downhole device disposed within the wellbore, the second downhole device including a second outer housing including a second central bore extending axially through the second outer housing, the second central bore operable to convey subsurface production fluids there through; and

a switch system, the switch system including:

an input coupled to a primary electric control line;

a first output coupled to a first electrical component of the first downhole device;

and

a second output coupled to a second electrical component of the second downhole device, the switch system configured to switch power between the primary electric control line and the first downhole device and the primary electric control line and the second downhole device.

23. The well system as recited in Claim 22, wherein the first downhole device further includes a first valve closure mechanism coupled to the first outer housing within the first central bore, and a first bore flow management actuator disposed in the first central bore, the first bore flow management actuator configured to slide from a first initial state to a first subsequent state to move the first valve closure mechanism between a first closed state and a first open state, and the second downhole device further includes a second valve closure mechanism coupled to the second outer housing within the second central bore, and a second bore flow management actuator disposed in the second central bore, the second bore flow management actuator configured to slide from a second initial state to a second subsequent state to move the second valve closure mechanism between a second closed state and a second open state.

24. The well system as recited in Claim 22, wherein the switch system is a mechanical switch system that includes a mechanically activated switch configured to switch power between the primary electric control line and the first downhole device and the primary electric control line and the second downhole device.

25. The well system as recited in Claim 24, wherein the mechanically activated switch includes two or more magnetic features, the two or more magnetic features configured to move to switch power between the primary electric control line and the first downhole device and the primary electric control line and the second downhole device.

26. The well system as recited in Claim 25, wherein at least one of the two or more magnetic features is coupled to a sliding sleeve of the first downhole device, and further wherein as the one of the two or more magnetic features slides with the sliding sleeve, an other of the two or more magnetic features magnetically coupled with the one of the two or more magnetic features

moves to switch power between the primary electric control line and the first downhole device and the primary electric control line and the second downhole device.

27. The well system as recited in Claim 26, wherein the other of the two or more magnetic features is configured to move between a first position forming a first closed circuit with the first downhole device and forming a first open circuit with the second downhole device and a second position forming a second open circuit with the first downhole device and forming a second closed circuit with the second downhole device.

28. The well system as recited in Claim 27, further including an insulator separating the first output and the second output.

29. The well system as recited in Claim 24, wherein the mechanically activated switch includes a reed switch.

30. The well system as recited in Claim 29, wherein the reed switch is a double throw reed switch.

31. The well system as recited in Claim 29, wherein the reed switch is a first reed switch, and further including a second reed switch configured to work in conjunction with the first reed switch to switch power between the primary electric control line and the first downhole device and the primary electric control line and the second downhole device.

32. The well system as recited in Claim 24, wherein the mechanically activated switch includes a tunnel magneto-resistance (TMR) switch.

33. The well system as recited in Claim 22, wherein the switch system is an electrical switch system that includes an electrically activated switch configured to switch power between the primary electric control line and the first downhole device and the primary electric control line and the second downhole device.

34. The well system as recited in Claim 33, wherein the electrically activated switch includes two or more oppositely oriented diodes, the two or more oppositely oriented diodes configured to switch power between the primary electric control line and the first downhole device and the primary electric control line and the second downhole device.

35. The well system as recited in Claim 34, wherein a first of the two or more oppositely oriented diodes is configured to form a first closed circuit with the first downhole device and a first open circuit with the second downhole device when receiving a positive voltage, and a second of the two or more oppositely oriented diodes is configured to form a second open circuit with the first downhole device and a second closed circuit with the second downhole device when receiving a negative voltage.

36. The well system as recited in Claim 22, wherein the first downhole device is a tubing retrievable safety valve (TRSV) and the second downhole device is a wireline retrievable safety valve (WLRSV).

37. The well system as recited in Claim 36, wherein the switch system is configured to switch power between the primary electric control line and the tubing retrievable safety valve (TRSV) and the primary electric control line and the wireline retrievable safety valve (WLRSV) before the wireline retrievable safety valve (WLRSV) is insert within a wellbore.

38. The well system as recited in Claim 36, wherein the switch system is configured to switch power between the primary electric control line and the tubing retrievable safety valve (TRSV) and the primary electric control line and the wireline retrievable safety valve (WLRSV) as the wireline retrievable safety valve (WLRSV) is being insert within a wellbore.

39. The well system as recited in Claim 36, wherein the switch system is configured to switch power between the primary electric control line and the tubing retrievable safety valve (TRSV) and the primary electric control line and the wireline retrievable safety valve (WLRSV) after the wireline retrievable safety valve (WLRSV) is insert within a wellbore.

40. The well system as recited in Claim 22, wherein the first electrical component of the first downhole device is a first electromagnetic assembly.

41. The well system as recited in Claim 40, wherein the second electrical component of the second downhole device is a second electromagnetic assembly.

42. The well system as recited in Claim 22, wherein the first electrical component is an electric motor or pump, a piezoelectric actuator, or a solenoid valve.

43. A method, comprising:
positioning a first downhole device disposed in line with production tubing located in a wellbore, the first downhole device including a first outer housing including a first central bore extending axially through the first outer housing, the first central bore operable to convey subsurface production fluids there through;

positioning a second downhole device in the wellbore, the second downhole device including a second outer housing including a second central bore extending axially through the second outer housing, the second central bore operable to convey subsurface production fluids there through, wherein a switch system is coupled with the first and second downhole devices, the switch system including:

an input coupled to a primary electric control line;

a first output coupled to a first electrical component of the first downhole device;

and

a second output coupled to a second electrical component of the second downhole device, the switch system configured to switch power between the primary electric control line and the first downhole device and the primary electric control line and the second downhole device; and

switching a signal from the primary electric control line between the first and second downhole devices.

44. The method as recited in Claim 43, wherein the first downhole device further includes a first valve closure mechanism coupled to the first outer housing within the first central bore, and a first bore flow management actuator disposed in the first central bore, the first bore flow

management actuator configured to slide from a first initial state to a first subsequent state to move the first valve closure mechanism between a first closed state and a first open state, and the second downhole device further includes a second valve closure mechanism coupled to the second outer housing within the second central bore, and a second bore flow management actuator disposed in the second central bore, the second bore flow management actuator configured to slide from a second initial state to a second subsequent state to move the second valve closure mechanism between a second closed state and a second open state.