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(71) Applicant: **EOG RESOURCES, INC.** [US/US]; 1111 Bagby, Sky Lobby 2, Houston, Texas 77002 (US).

(72) Inventors: **STRALOW, Josh**; 1111 Bagby, Sky Lobby 2, Houston, Texas 77002 (US). **PALMIERI, Dominic**; 1111 Bagby, Sky Lobby 2, Houston, Texas 77002 (US).

(74) Agent: **SULLIVAN, Kristian R.** et al.; 575 N. Dairy Ashford Rd., Suite 1102, Houston, Texas 77079 (US).

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(54) Title: INJECTION SYSTEMS FOR SUBTERRANEAN WELLBORES

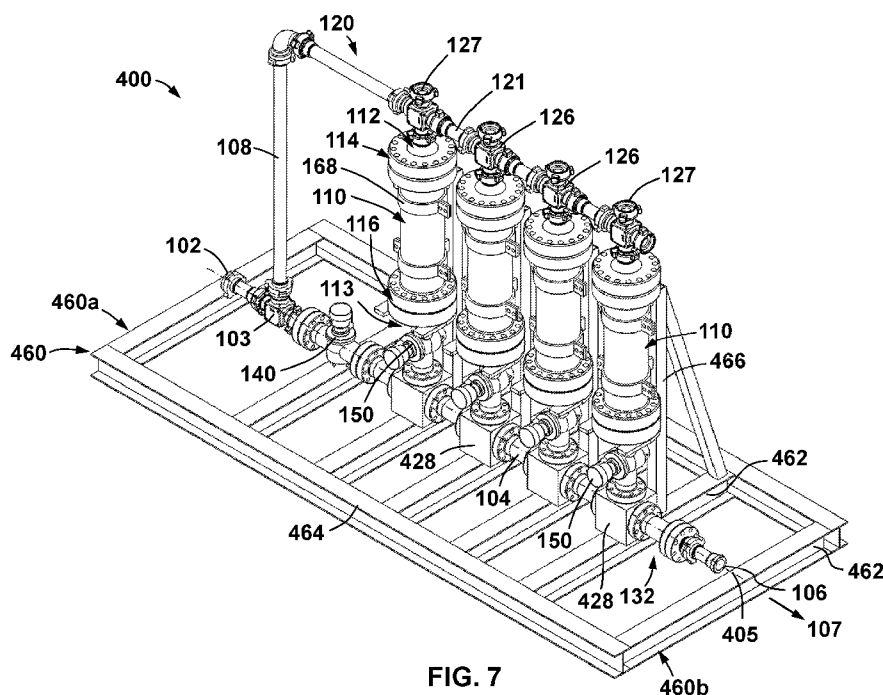


FIG. 7

(57) Abstract: A diverter injection system is disclosed herein along with systems and methods relating thereto. In an embodiment, the diverter injection system includes a system inlet and a system outlet. In addition, the diverter injection system includes a canister including an internal volume configured to retain diverter therein. Further, the diverter injection system includes a first flow path extending between the system inlet and the system outlet that bypasses the canister, and a second flow path that extends from the system inlet, through the canister, and then to the system outlet. Still further, the diverter injection system includes a plurality of valves, wherein actuation of the plurality of valves is configured to selectively switch between the first flow path and the second flow path.

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AMENDED CLAIMS

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In the Claims

1. A system, comprising:
 - a pump having a discharge; and
 - a diverter injection system fluidly coupled between the discharge of the pump and a subterranean well, wherein the diverter injection system comprises:
 - a system inlet;
 - a system outlet;
 - a canister including an internal volume configured to retain diverter therein;
 - a first flow path extending between the system inlet and the system outlet that bypasses the canister;
 - a second flow path that extends from the system inlet, through the canister, and then to the system outlet; and
 - a plurality of valves, wherein actuation of the plurality of valves is configured to selectively switch between the first flow path and the second flow path.
2. The system of claim 1, wherein the diverter injection system comprises:
 - a first line extending from the system inlet to the system outlet;
 - a second line extending from the first line and coupled to an inlet of the canister;
 - and
 - a connection line coupled between an outlet of the canister and the first line, downstream of the second line;wherein the first flow path extends from the system inlet to the system outlet along the first line; and
wherein the second flow path extends from the system inlet, through the second line, the canister, and the connection line, to the system outlet.
3. The system of claim 2, wherein the plurality of valves comprises:
 - a first valve disposed along the first line between the second line and the system outlet; and
 - a second valve disposed along the connection line.

4. The system of claim 3, comprising a controller coupled to the first valve and the second valve, wherein the controller is configured to:
 - open the first valve and close the second valve to flow fluid along the first flow path; and
 - close the first valve and open the second valve to flow fluid along the second flow path.
5. The system of claim 4, wherein the controller is configured to close the first valve after opening the second valve to flow fluid along the second flow path.
6. The system of claim 4, wherein the controller is configured to actuate the first valve and the second valve to switch from the first flow path to the second flow path in response to a pressure measurement within the subterranean well.
7. The system of claim 1, wherein the system is configured to place the internal volume of the canister in fluid communication with the system inlet when fluid is flowing through the first flow path and when fluid is flowing through the second flow path.
8. A method, comprising:
 - (a) discharging a pressurized stream from a pump;
 - (b) flowing the pressurized stream through a first flow path of a diverter injection system during (a), wherein the diverter injection system includes a system inlet, a system outlet, and a canister, and wherein the first flow path bypasses the canister and extends between the system inlet and the system outlet;
 - (c) switching from the first flow path after (b) to a second flow path of the diverter injection system and flowing the pressurized stream through the second flow path during (a), wherein the second flow path extends from the system inlet, through the canister, and to the system outlet; and
 - (d) flowing diverter out of the canister toward a subterranean well during (c).
9. The method of claim 8, wherein (a) comprises discharging the pressurized stream at a pressure of 1000-15000 psi.

10. The method of claim 8, wherein (c) comprises actuating a plurality of valves within the diverter injection system to switch from the first flow path to the second flow path.
11. The method of claim 10, comprising detecting a pressure within the subterranean well, and wherein (c) comprises actuating the plurality of valves in response to detecting the pressure.
12. The method of claim 11, wherein the diverter injection system comprises:
a first line extending from the system inlet to the system outlet;
a second line extending from the first line and coupled to an inlet of the canister;
and
a connection line coupled between an outlet of the canister and the first line,
downstream of the second line;
wherein the first flow path extends from the system inlet to the system outlet along
the first line; and
wherein the second flow path extends from the system inlet, through the second
line, the canister, and the connection line, to the system outlet.
13. The method of claim 12,
wherein the plurality of valves comprises:
a first valve disposed along the first line between the second line and the
connection line; and
a second valve disposed along the connection line; and
wherein (c) comprises:
(c1) closing the first valve and opening the second valve to switch from
the first flow path to the second flow path.
14. The method of claim 13, wherein (c1) comprises opening the second valve; and
then closing the first valve.
15. The method of claim 8, comprising communicating the pressurized stream with an
internal volume of the canister during (b) and (c).

16. A diverter injection system, comprising:
- a system inlet configured to be coupled to a discharge of a pump;
 - a system outlet configured to be coupled to a subterranean well;
 - a plurality of canisters, wherein each canister comprises an internal volume to hold diverter therein;
 - a main line extending from the system inlet to the system outlet;
 - an inlet manifold coupled to an inlet of each of the plurality of canisters;
 - a bypass line extending from the main line to the inlet manifold;
 - a plurality of connection lines, wherein each connection line is coupled between an outlet of a corresponding one of the plurality of canisters and the system outlet;
 - a main valve disposed along the main line between the bypass line and the system outlet; and
 - a plurality of canister valves, wherein each canister valve is disposed along a corresponding one of the plurality of connection lines;
- wherein the main valve and the plurality of canister valves are configured to actuate such that flow through the diverter injection system is to switch between:
- a first flow path extending from the system inlet to the system outlet along the main line; and
 - a plurality of second flow paths, wherein each second flow path extends from the system inlet, through the bypass line, the inlet manifold, the corresponding one of the plurality of canisters, and the corresponding one of the plurality of connection lines to the system outlet;
- wherein the internal volume of each of the canisters is configured to be in fluid communication with the system inlet when fluid is flowed through the first flow path and the plurality of second flow paths.

17. The diverter injection system of claim 16, comprising a controller coupled to the main valve and the plurality of canister valves, wherein the controller is configured to:
- open the main valve and close each of the plurality of canister valves to flow fluid along the first flow path; and
 - close the main valve and open one or more of the plurality of canister valves to flow fluid along one or more of the second flow paths.
18. The diverter injection system of claim 17, wherein the controller is configured to close the main valve after opening the one or more of the plurality of canister valves to flow fluid along the one or more of the second flow paths.
19. The diverter injection system of claim 17, wherein the controller is configured to actuate the main valve and the one or more of the plurality of canister valves to switch from the first flow path to the one or more of the second flow paths in response to a pressure measurement from within the subterranean well.
20. The diverter injection system of claim 16, wherein each of the plurality of canisters is oriented such that, the inlet of the canister is vertically above the outlet, and wherein each canister valve is disposed vertically below the outlet of the corresponding canister.