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(56) Documents Cited:  
US 6098714 A US 5284205 A  
US 4252197 A US 20130092396 A1  
US 20080128137 A1

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(54) Title of the Invention: Variable diameter piston assembly for safety valve  
Abstract Title: Variable diameter piston assembly for safety valve

(57) Disclosed are subsurface safety valves having a reduced spread between opening and closing pressures. One safety valve includes a housing having a piston bore defined therein and configured to receive hydraulic fluid pressure, the piston bore providing an upper bore having a first diameter, a lower bore having a second diameter, and an intermediate bore interposing the upper and lower bores and having a third diameter, wherein the third diameter is greater than the second diameter and the second diameter is greater than the first diameter, and a piston assembly movably arranged within the piston bore and comprising an upper piston operatively coupled to a lower piston, wherein the upper piston sealingly engages the upper bore and the lower piston sealingly engages the lower bore, wherein, when the upper piston is arranged in the intermediate bore, the hydraulic fluid pressure acts on the lower piston.

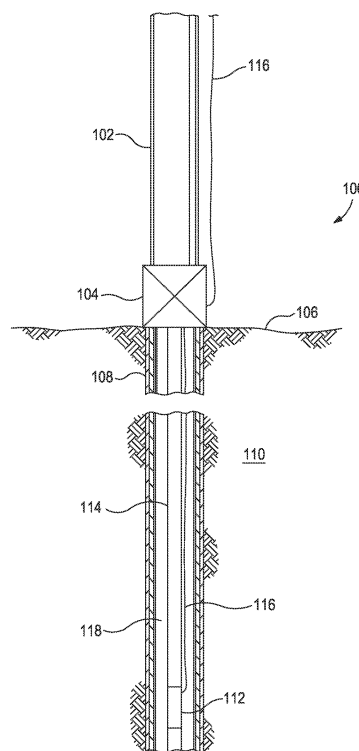


FIG. 1