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**Bishop et al.**

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(54) **BI-DIRECTIONAL BALL SEAT SYSTEM AND METHOD**

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(22) Filed: **Feb. 24, 2003**

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(51) **Int. Cl.**

**E21B 34/14** (2006.01)

(52) **U.S. Cl.** ..... **166/373**; 166/386; 166/317; 166/318; 166/332.1

(58) **Field of Classification Search** ..... 166/316–319, 166/321, 325, 328, 332.1, 334.1, 376, 373, 166/386

See application file for complete search history.

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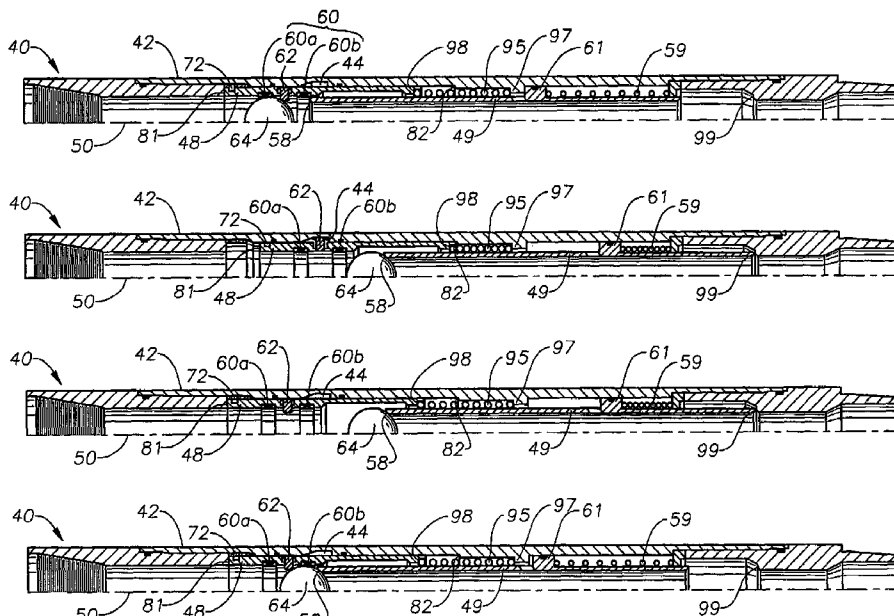
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(57) **ABSTRACT**

The present invention provides a bi-directional ball seat and method of use. In at least one embodiment, the present invention provides a fluid control system that includes a radial protrusion that can be selectively engaged and disengaged upstream and/or from a ball seat. For example, a ball can be placed in a passageway, engaged with a downstream ball seat, and the radial protrusion radially extended into the passageway distally from the seat relative to the ball. A reverse movement of the ball is restricted by the active radial movement of the radial protrusion into the passageway. The control system can be used to control a variety of tools associated with the well. Without limitation, the tools can include crossover tools, sleeves, packers, safety valves, separators, gravel packers, perforating guns, decoupling tools, valves, and other tools know to those with ordinary skills in the art.

**43 Claims, 10 Drawing Sheets**



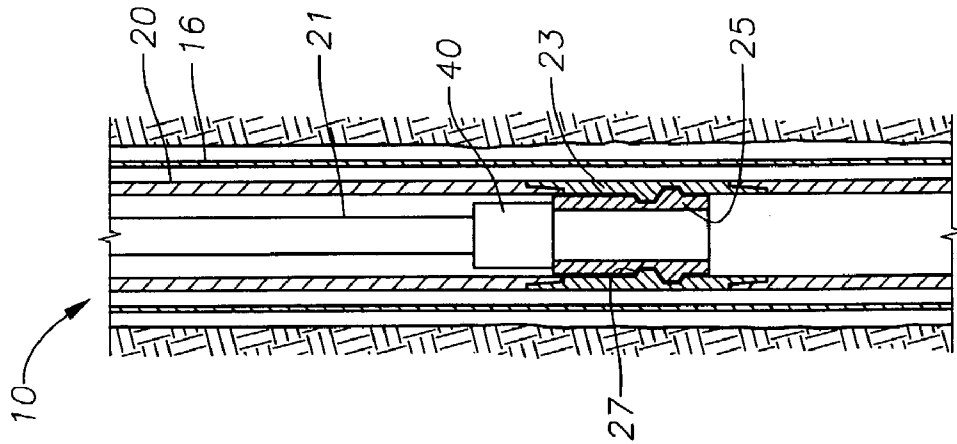


Fig. 1B

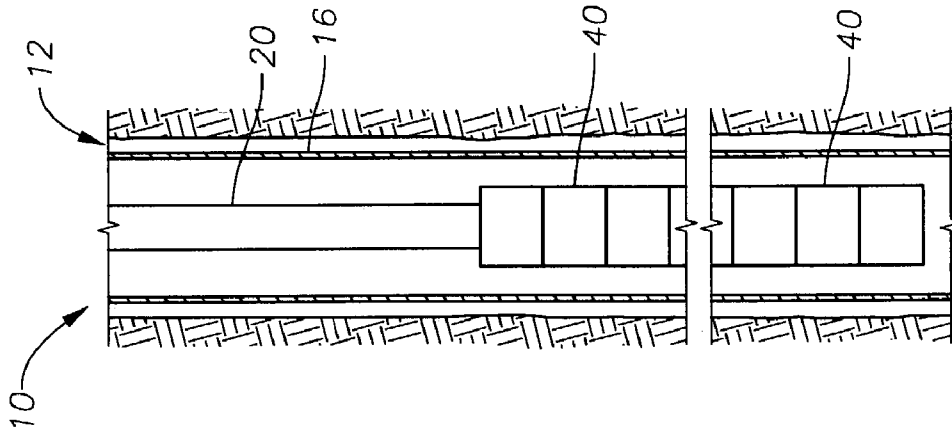


Fig. 1A

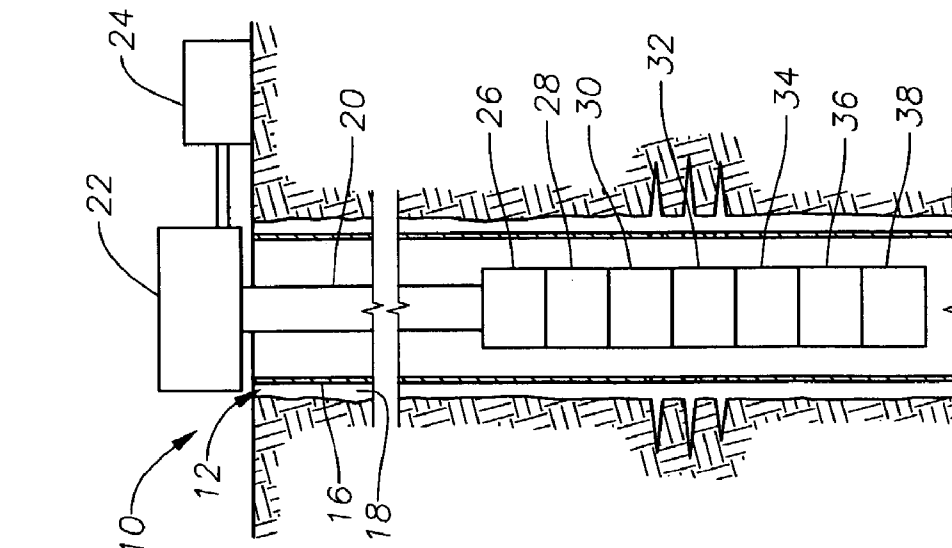


Fig. 1

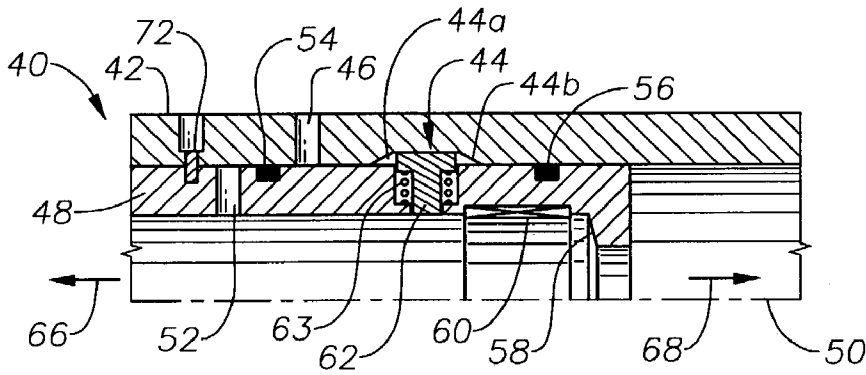


Fig. 2A

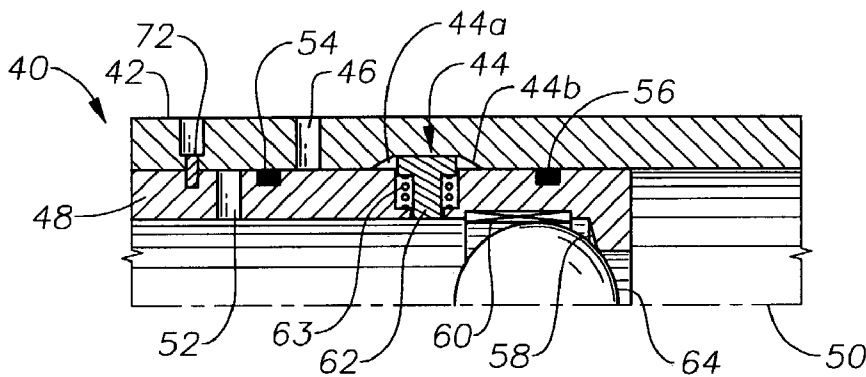


Fig. 2B

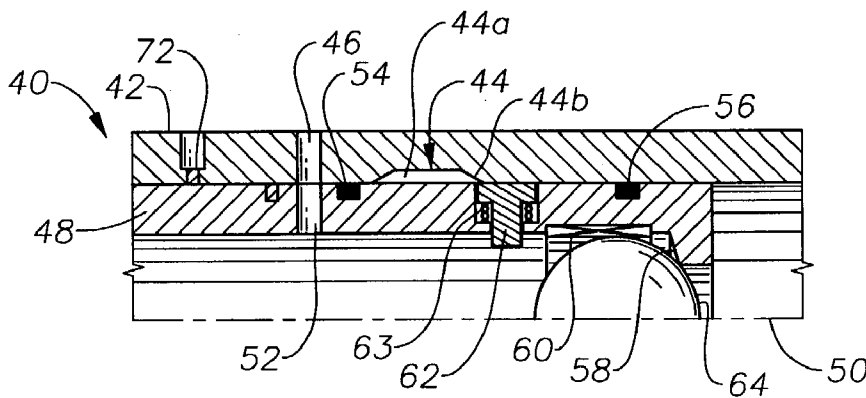


Fig. 2C

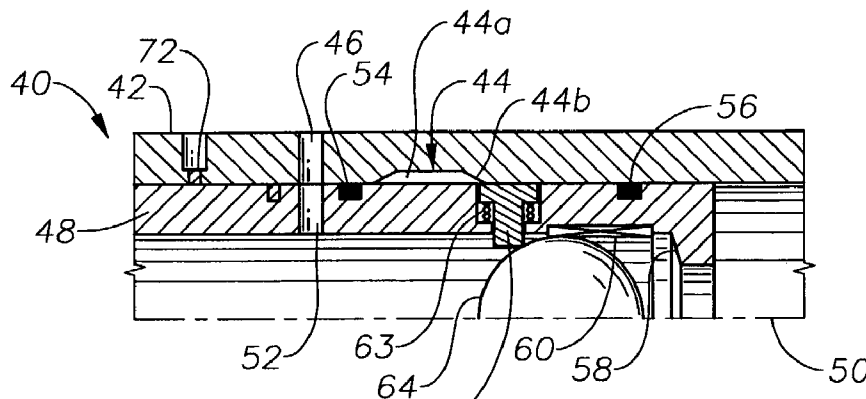


Fig. 2D

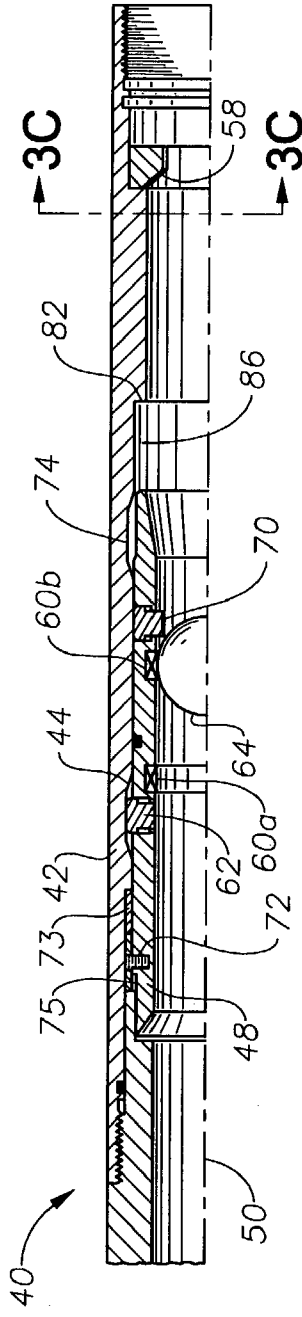


Fig. 3A

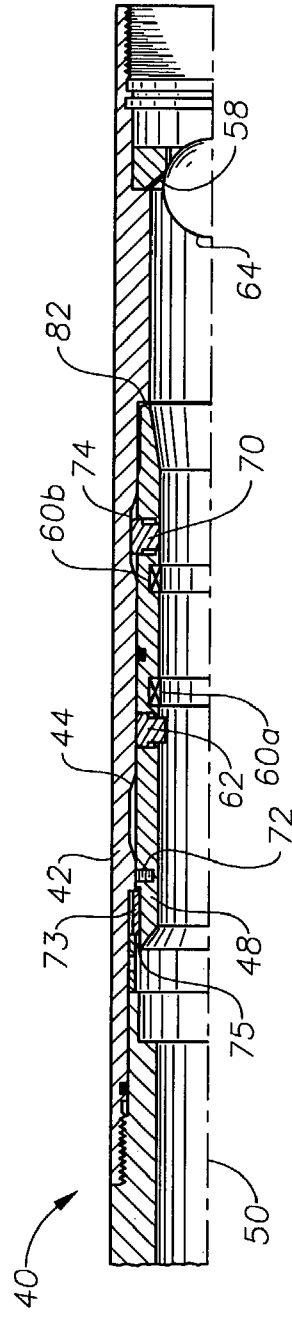


Fig. 3B

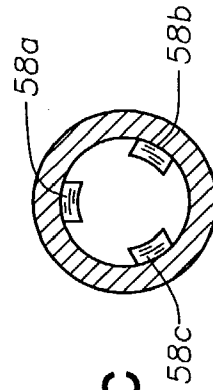


Fig. 3C

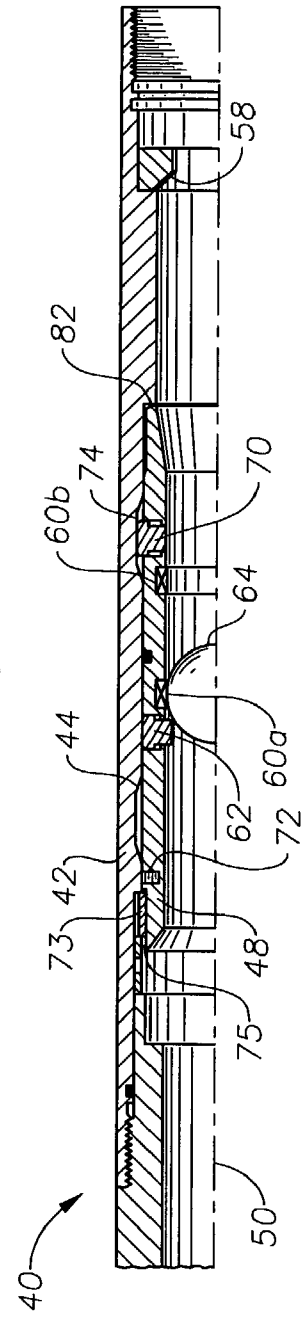


Fig. 3D

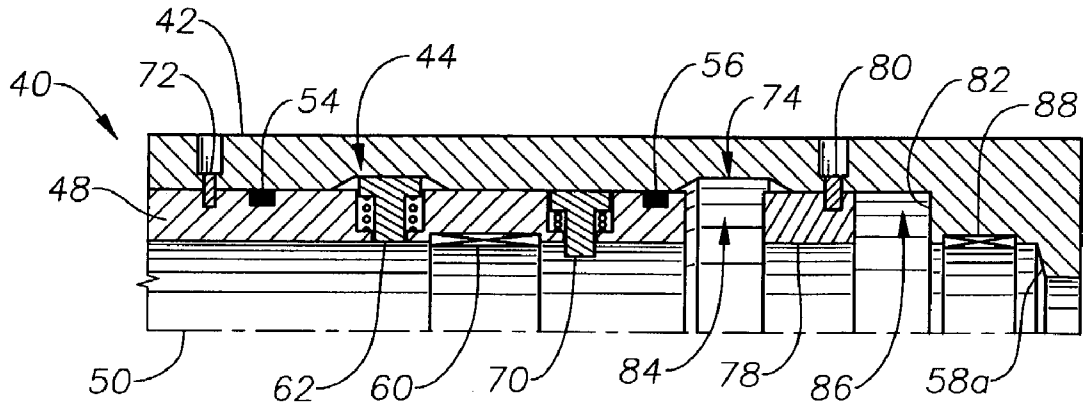


Fig. 4A

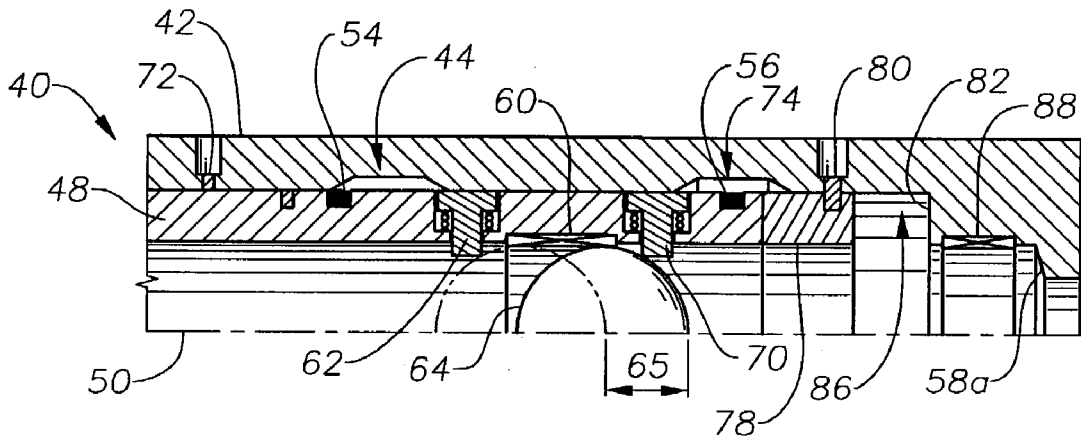


Fig. 4B

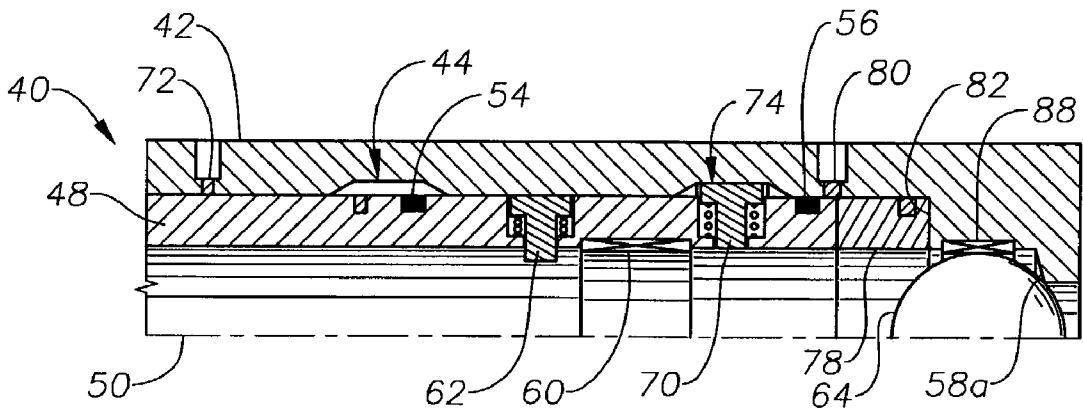


Fig. 4C

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