

[54] SOLENOID OPERATED HYDRAULIC CONTROL VALVE

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Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 237,498, Aug. 26, 1988, abandoned.

[51] Int. Cl.<sup>5</sup> ..... F16K 31/06; H01F 7/13

[52] U.S. Cl. .... 335/279; 251/129.16; 251/129.05; 251/129.07  
[58] Field of Search ..... 251/129.16, 129.05, 251/129.07; 335/279

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Primary Examiner—Arnold Rosenthal  
Attorney, Agent, or Firm—Neuman, Williams et al.

[57] ABSTRACT

A solenoid operated hydraulic control valve which has a specially ported spool valve to statically balance spool force in the opened and closed positions, and a specially designed solenoid operator which includes very small ratios of gaps to cross-sectional areas for the working and non-working gaps between the armature and stator.

22 Claims, 7 Drawing Sheets

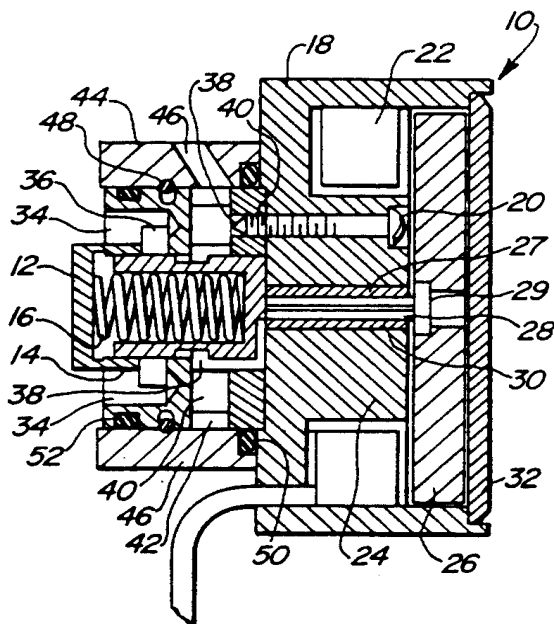


FIG. 1

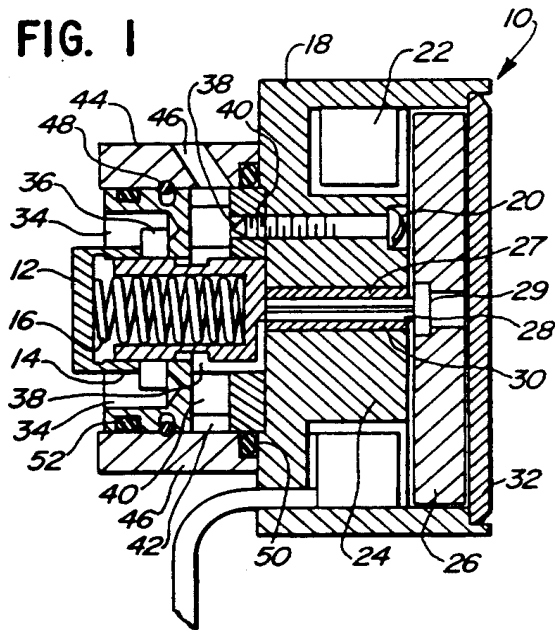


FIG. 2

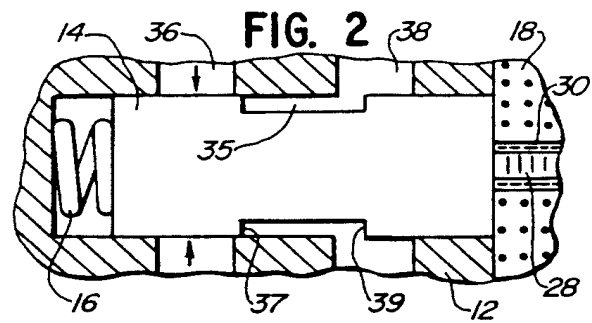


FIG. 3

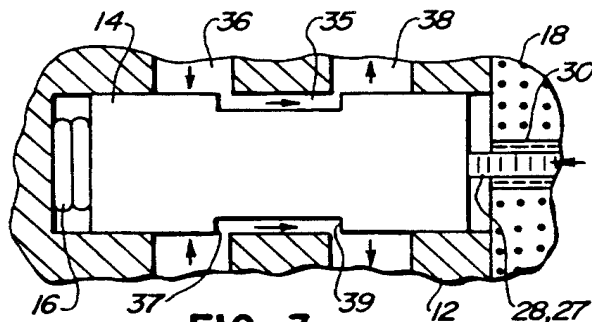


FIG. 4

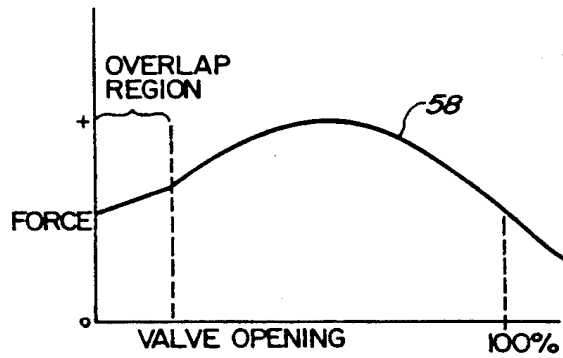
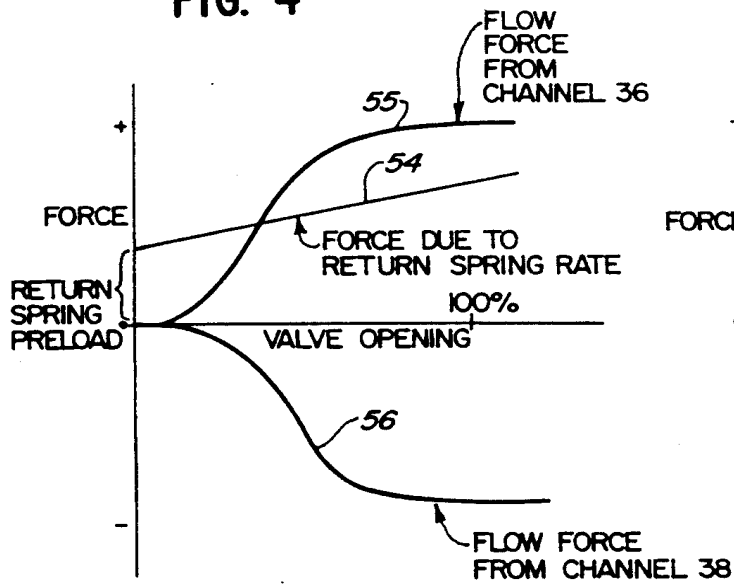


FIG. 5

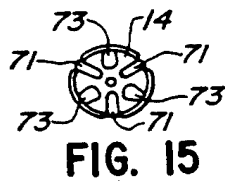
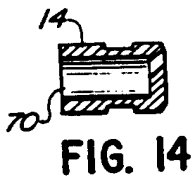
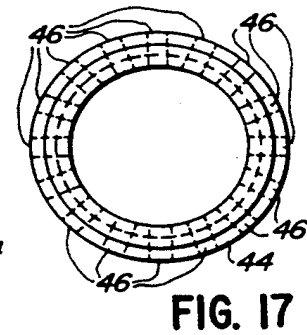
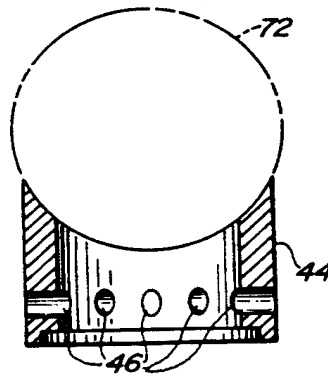
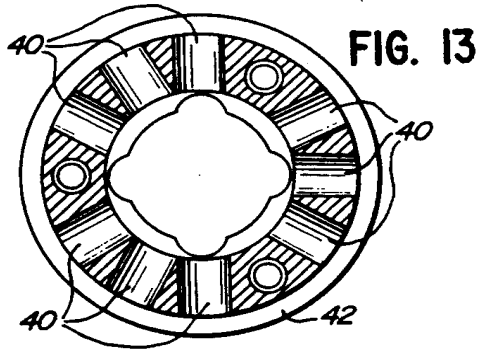
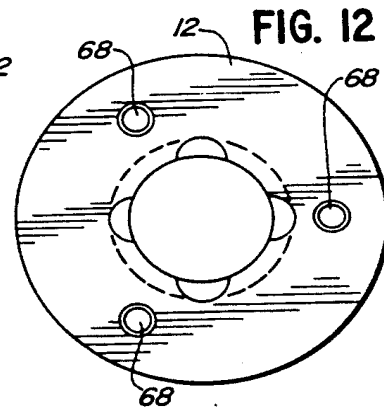
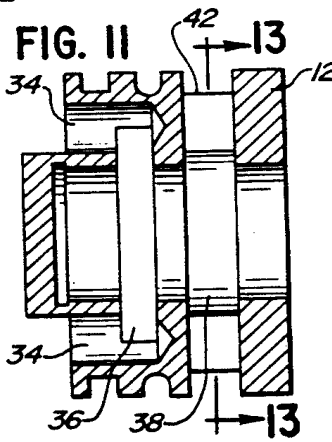
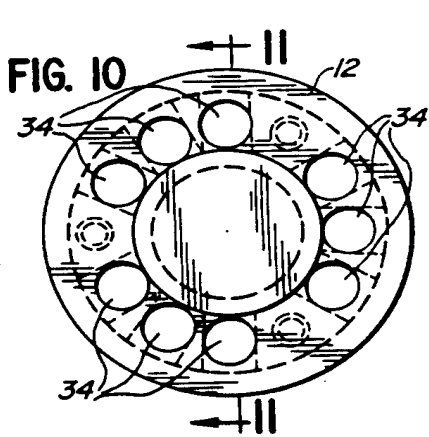
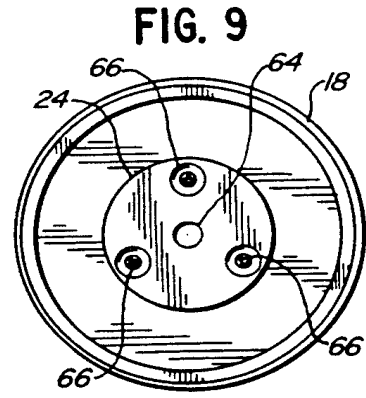
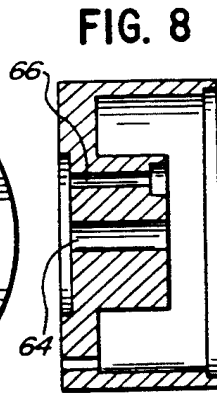
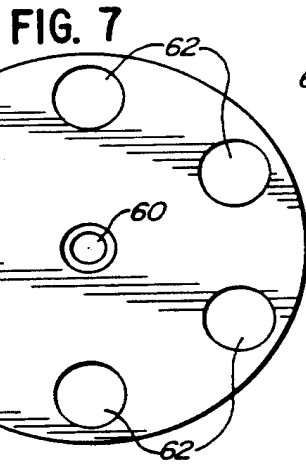
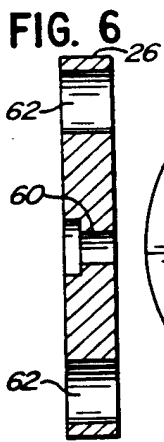


FIG. 16

FIG. 17

FIG. 18

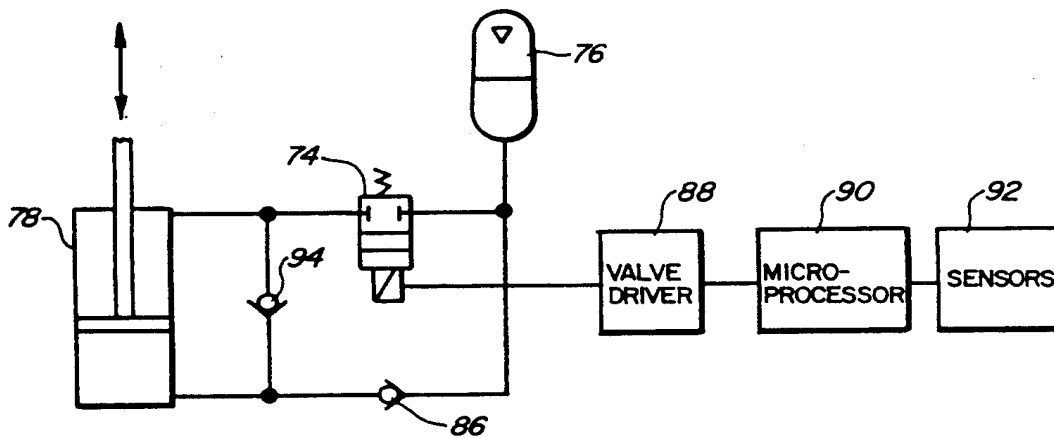
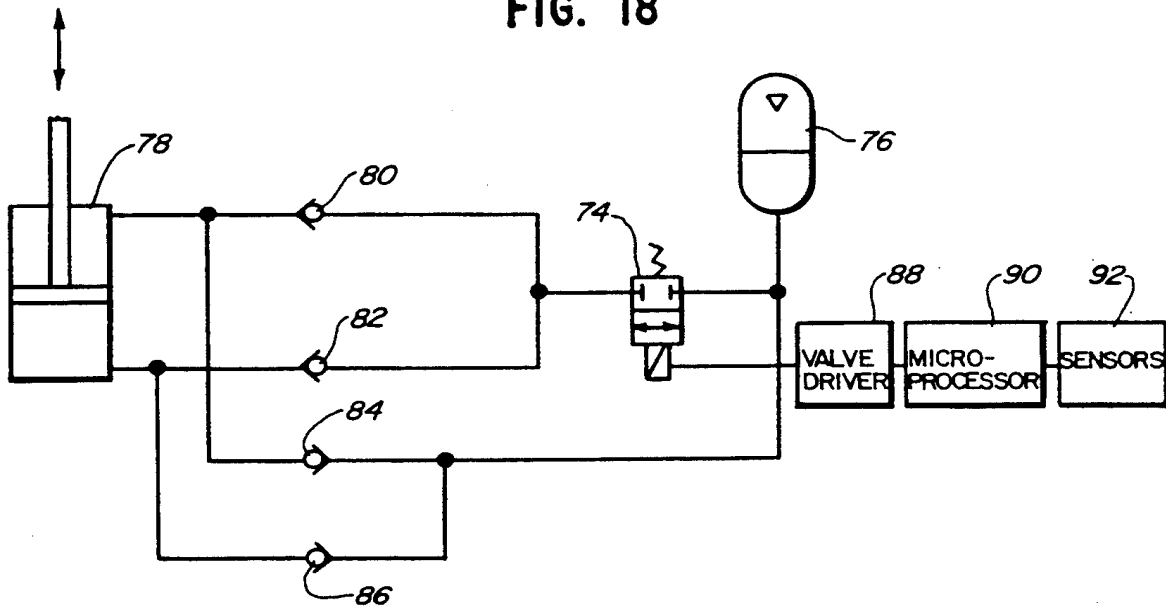


FIG. 19

FIG. 20

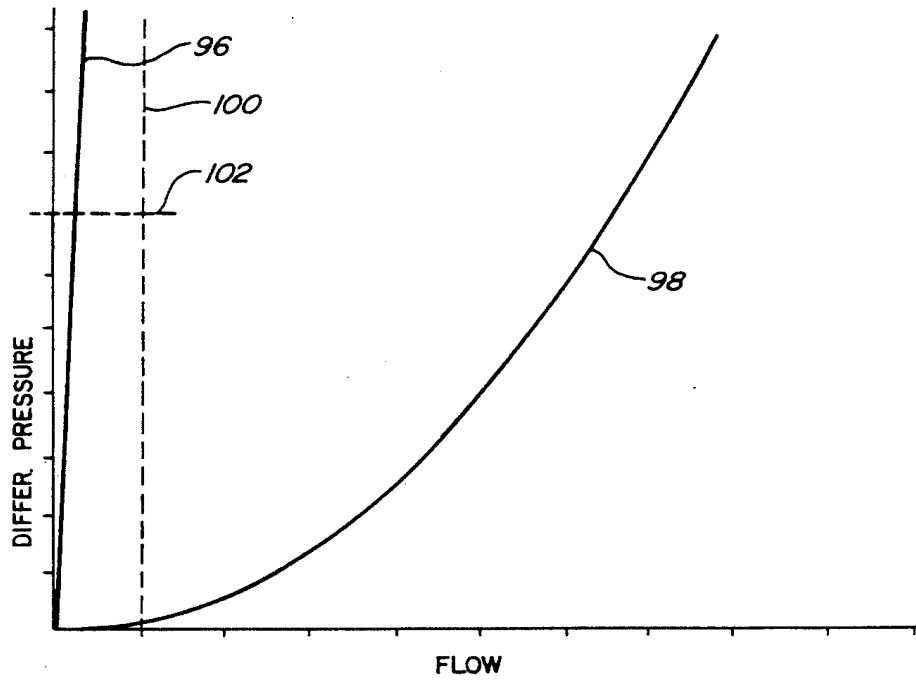
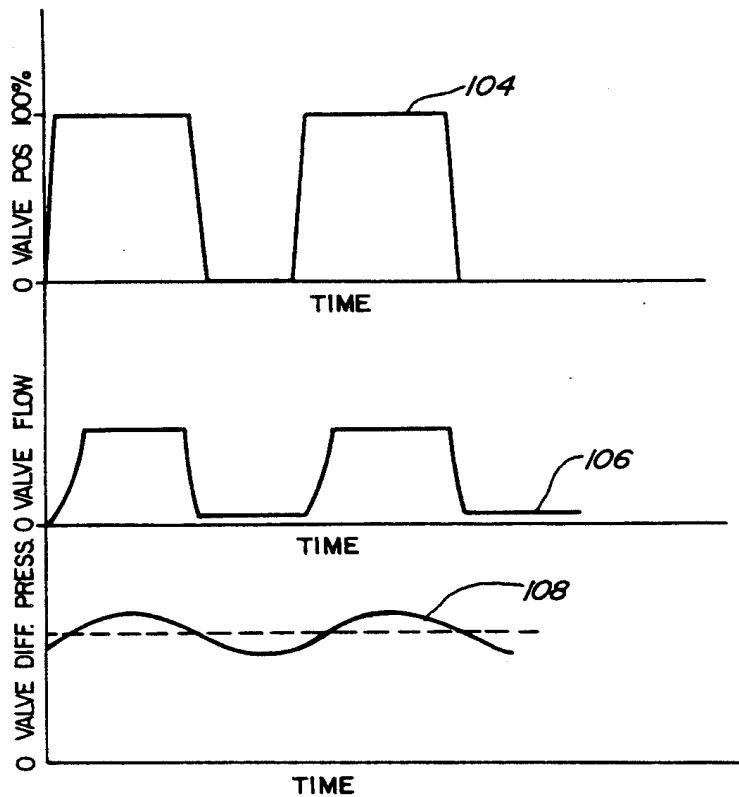


FIG. 21



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