United States Patent [19]

Mazur et al.

[11] **3,722,540**

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[54] SECTIONAL CONTROL VALVES

[75] Inventors: **Joseph N. Mazur**, Poland; **Edward J. Ratkay**, Canfield; **Robert F. Hodgson**, Mahoning, all of Ohio

[73] Assignee: **Commercial Shearing & Stamping Company**, Youngstown, Ohio

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[52] **U.S. Cl.** **137/596**

[51] **Int. Cl.** **F16k 11/00**

[58] **Field of Search** 137/596, 269; 251/367, 366

[56] **References Cited**

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Primary Examiner—Henry T. Klinksiek
Assistant Examiner—Robert J. Miller
Attorney—Buell, Blenko & Ziesenheim

[57] **ABSTRACT**

A sectional control valve is provided made up of a plurality of control sections between an inlet manifold and an outlet manifold, the sections having interconnecting high pressure passages and low pressure passages which connect with one another at the junction of the sections, each control section having service passages means for connecting a fluid motor and a movable valve element to control communication of its service passage means with its high and low pressure passages, said sections having substantially flat mating surfaces at their junctions, a relief groove extending lengthwise of this section through at least one of said flat mating surfaces parallel to the movable element and intersecting the low pressure passages, said high pressure passages intersecting the flat mating surfaces spaced from said relief groove and continuous low pressure seal means surrounding the low and high pressure passages and intersecting the relief groove adjacent its ends.

5 Claims, 5 Drawing Figures

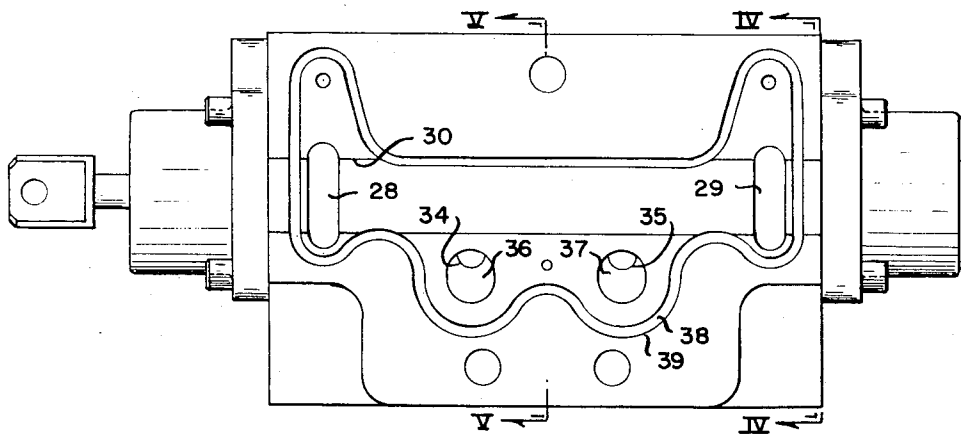


Fig. 1.

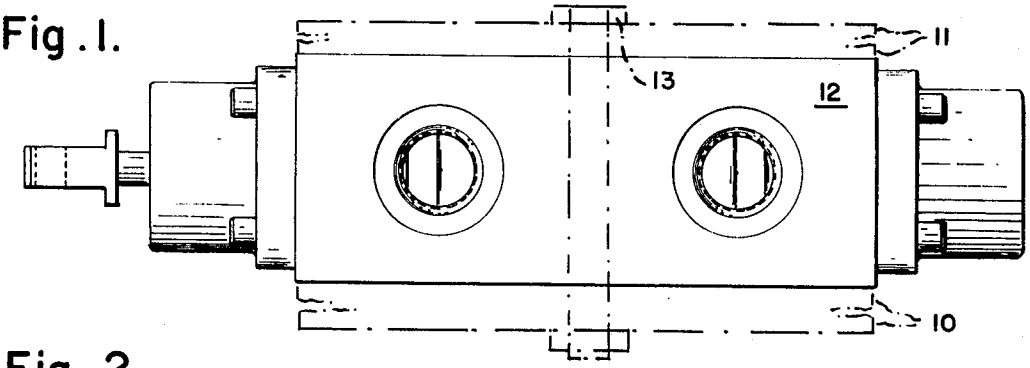


Fig. 2.

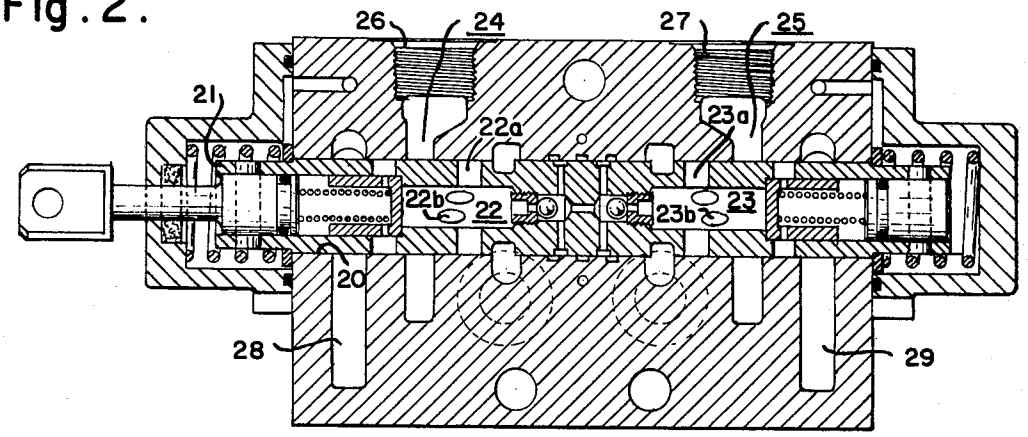


Fig. 3.

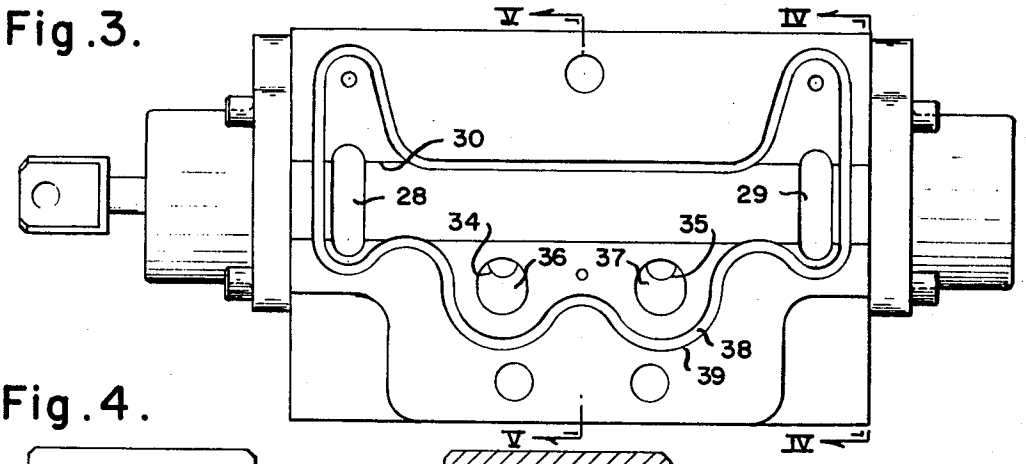
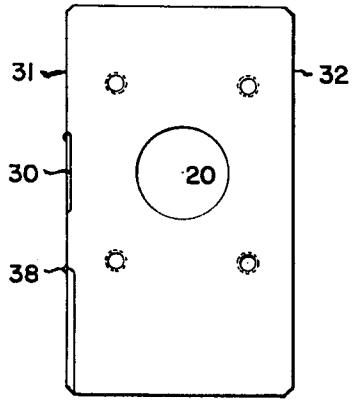


Fig. 4.



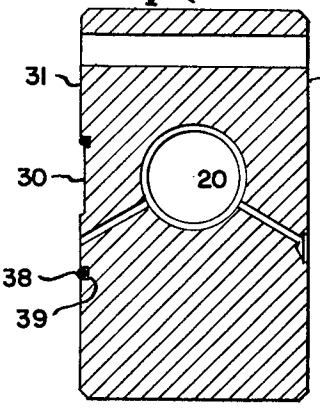


Fig. 5.

INVENTORS
Joseph N. Mazur,
Edward J. Ratkay &
Robert F. Hodgson

By Buell, Blenko & Ziesenheim
their attorneys

SECTIONAL CONTROL VALVES

This invention relates to sectional control valves and particularly to sectional valve interface sealing systems.

Sectional control valves are generally well known in the art. They generally consist of an inlet manifold and an outlet manifold with a plurality of control sections therebetween. Fluid under pressure is delivered to the inlet manifold, passed through the control sections and collected in the exhaust or outlet manifold and returned to a tank. It is obvious that in order to pass the fluid through the several control valves from inlet manifold to outlet manifold it is necessary for the several sections to have interconnecting passages, at least some of which carry high pressure fluid and others carry low pressure fluid.

This type of sectional control valve has many recognized advantages, but at the same time suffer from the problem of leakage of fluid at the joints between sections which fluid escapes to the exterior of the valve mechanism. This is undesirable because it is not only wasteful of hydraulic fluid but provides a wet, oily surface upon which dirt accumulates as unsightly accretions on the apparatus.

The present invention provides a system for sealing the mating surfaces of these valve sections so as to prevent fluid leakage to the valve exterior and to recover any fluid which leaks from the passages into the area between sections.

Preferably we provide a sectional control valve made up of a plurality of control sections between an inlet manifold and an outlet manifold, said sections having interconnecting high pressure passages and low pressure passages which connect with one another at the junction of the sections, each control section having service passage means for connecting a fluid motor and a movable valve element to control communication of its service passage means with its high pressure and low pressure passages, said sections each having substantially flat mating surfaces at their junctions, a relief groove extending lengthwise of the section through at least one of said flat mating surfaces parallel to the movable element and intersecting the low pressure passages, said high pressure passage intersecting the flat mating surfaces spaced from said relief groove, and means surrounding the low and high pressure passages and intersecting the relief groove adjacent each of its ends defining a low pressure seal. Preferably the movable valve element operates in a longitudinal bore in the section which bore intersects all low and high pressure passages. The movable valve element is preferably hollow at each end and solid in the middle providing two spaced apart axial cavities with spaced passages communicating through the valve element wall adjacent each end. The low pressure seal is preferably a continuous rubber strand in a shallow groove in the mating surfaces. Any fluid which escapes the high pressure passages is directed into their low pressure passages by means of the seal and longitudinal groove.

In the foregoing general description of our invention we have set out certain objects, purposes and advantages of our invention. Other objects, purposes and advantages of this invention will be apparent from a consideration of the following description and the accompanying drawings, in which:

FIG. 1 is a top plan view of a sectional control valve;

FIG. 2 is a cross-sectional view of a valve control section embodying our invention,

FIG. 3 is a side elevational view of a mating surface of a control section according to our invention;

FIG. 4 is an end elevational view of the control section of FIG. 2 taken on the line IV—IV of FIG. 3; and

FIG. 5 is a section on the line V—V of FIG. 3.

Referring to the drawings, we have illustrated a sectional control valve embodying this invention including an inlet manifold **10**, an outlet manifold **11** and a plurality of intermediate control sections **12**. A plurality of bolts **13** pass through both manifolds and the control sections to hold all the sections tightly clamped together.

The control sections **12** are of the closed center type arranged to provide parallel circuit operation. The control section shown in FIG. 3 is of the double acting type. It is provided with a longitudinal bore **20** with a valve element **21** slidable axially therein from a neutral position to one of two working positions. The valve element **21** is provided with a hollow axial cavity **22** and **23** at each end communicating through the valve element wall at spaced points by passages **22***a* and **22***b* and **23***a* and **23***b* respectively. In the two operating positions the valve element is adapted to connect one of the two parallel high pressure chambers **24** and **25** with one of the two motor ports **26** and **27** which are adapted to be connected to a hydraulic motor such as a cylinder or the like while connecting the other motor port with one of the two exhaust chambers **28** and **29**. A relief groove **30** is milled lengthwise of at least one of the mating or joining faces **31** and **32** of the control sections. The relief groove **30** extends parallel to the core **20** and intersects the exhaust chambers **28** and **29**. High pressure passages **34** and **35** extend angularly from the high pressure chambers **24** and **25** to the machined mating or joining faces **31** and **32** terminating in ports **36** and **37** spaced from the relief groove **30**. A continuous rubber O-ring type of low pressure seal **38** is inserted in a holding groove **39** which surrounds the area of the joining faces **31** and **32** carrying the ports **36** and **37** and openings of the exhaust chambers into the relief groove.

With the foregoing construction it will be evident that any high pressure fluid which escapes from the high pressure passages **34** and **35** will be directed to the relief groove **30** and will then enter one of the exhaust chambers where it will be returned to the tank.

This construction provides a number of advantages. It eliminates the troublesome leakage with the resultant undesirable accumulation of dirt and dust and it eliminates the problem of binding the movable valve member in the valve bore which occurred in prior art valves because of the distortion of the valve body by the escaped high pressure fluid trapped between adjacent valve sections. With the present construction, the relief groove **30** drains away the high pressure fluid from the area paralleling the bore so that no pressure can build up in this area.

While we have shown a preferred embodiment and practice of our invention in the foregoing specification, it will be understood that this invention may be otherwise embodied within the scope of the following claims.

We claim:

1. A sectional control valve comprising an inlet manifold, an outlet manifold, a plurality of control sections between said inlet and outlet manifolds, said sections having interconnecting high pressure passages and two interconnecting low pressure passages at opposite ends of the sections which connect with one another at the junction of the sections, each control section having service passage means for connecting a fluid motor and a movable valve element to control communication of its service passage means with its high and low pressure passages, said sections having substantially flat mating surface at their junctions, a relief groove extending lengthwise of the section through at least one of said flat mating surfaces parallel to the movable valve element and intersecting the low pressure passages, said high pressure passages intersecting the flat mating surfaces spaced from said relief groove and resilient low pressure seal means surrounding the low and high pressure passages and intersecting the relief groove adjacent each of its ends.

2. A sectional control valve as claimed in claim 1 wherein the movable valve element operates in a longitudinal bore in the section, which bore intersects all low and high pressure passages.

3. A sectional control valve as claimed in claim 1 wherein the valve element is hollow at each end and solid in the middle to provide two spaced apart axial cavities with spaced passages, communicating through the valve element wall adjacent each end.

4. A sectional control valve as claimed in claim 1 wherein the low pressure seal means is a continuous rubber ring in a shallow groove in at least one of the mating surfaces of each said sections.

5. A sectional control valve as claimed in claim 1 wherein the high pressure passages extend angularly from the bore to the mating surfaces.

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