Aug. 8, 1967 C. M. WESTBROOK 3,334,861

ROTARY SCROLL VALVE

Filed June 24, 1964 2 Sheets-Sheet 1

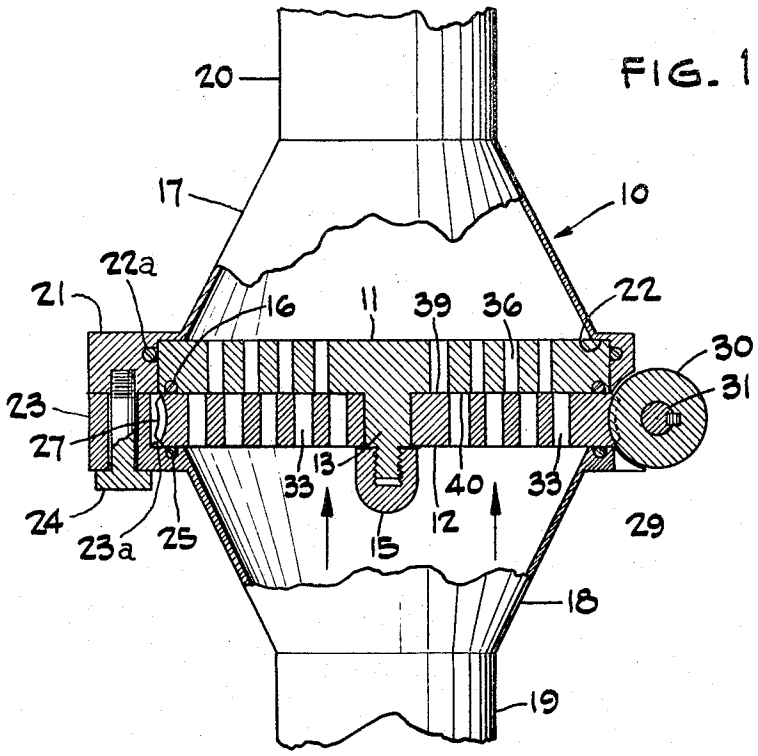


FIG. 1

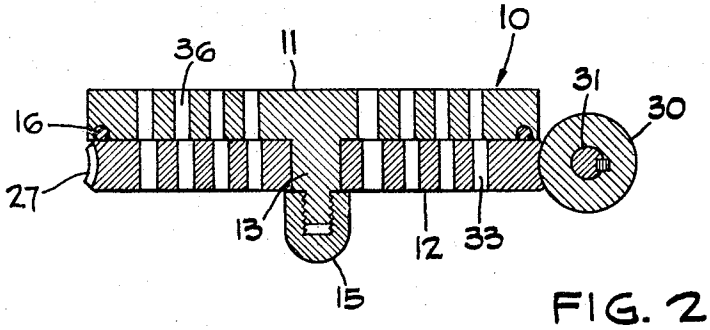


FIG. 2

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ROTARY SCROLL VALVE

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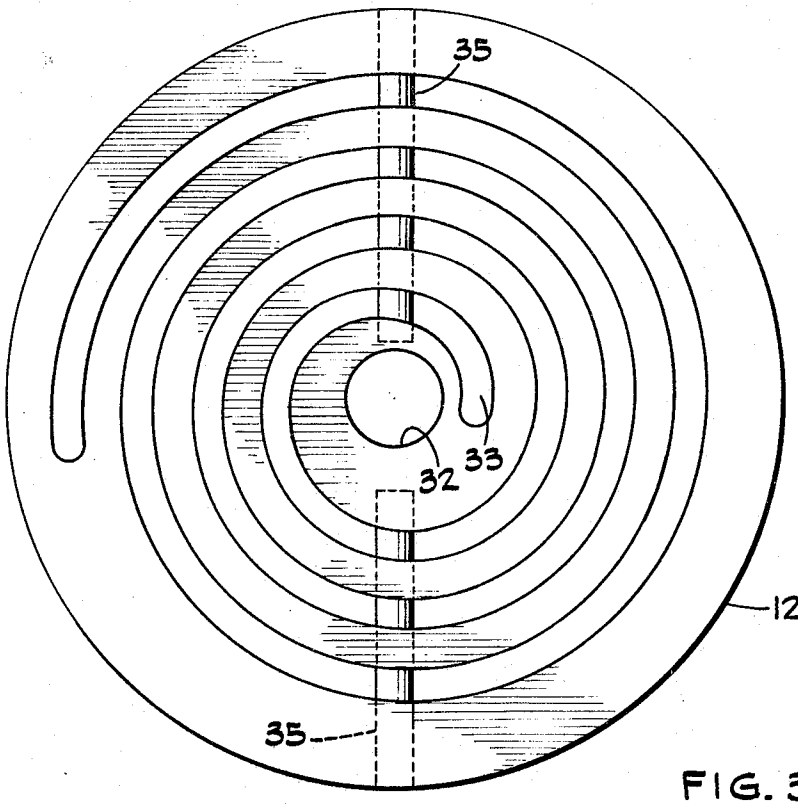


FIG. 3

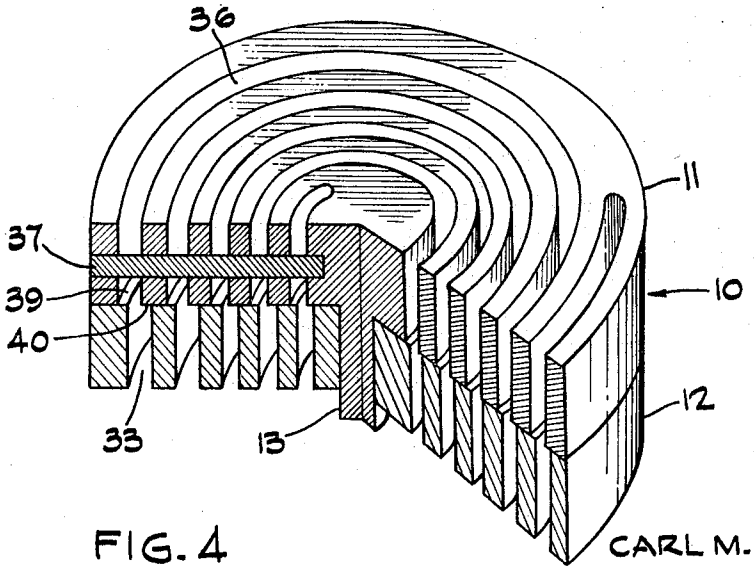


FIG. 4

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3,334,861

# ROTARY SCROLL VALVE

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2 Claims. (Cl. 251—208)

This invention relates to improvements in valves and more particularly relates to an improved form of variable rate of flow shut off valve of the scroll type.

A principal object of the invention is to provide a novel and improved form of rotatable valve of the scroll type, operable to uniformly vary the rate of flow through the valve from full flow to zero in a more efficient manner than in former valves of the same type.

Another object of the invention is to provide an improved form of disk valve having a stationary and rotatable disk in which the disks have spiral slots leaving axially therethrough, fully registering in one position of the disks and out of registry in another position of the disks to block the flow of fluid therethrough and to uniformly vary the flow of fluid from zero to full flow.

A still further object of the invention is to provide an infinitely variable rate of flow valve, in which the valve seat and valve member are in the form of abutting disks having spiral passageways leaving axially therethrough, and the valve member is rotatable about the valve seat to move the land area of the valve member over the open area of the valve seat and gradually cover the open area by the land area upon rotatable movement of the valve member to a position fully covering the open area of the valve seat.

These and other objects of the invention will appear from time to time as the following specification proceeds and with reference to the accompanying drawings wherein:

FIGURE 1 is a diagrammatic view of a valve constructed in accordance with the principles of the present invention, showing the valve member, and valve seat in cross section and showing the valve housing broken away and in section, with the land area of the valve member covering the open area of the valve seat;

FIGURE 2 is a diagrammatic sectional view taken through the valve member and its seat and showing the valve in an open position;

FIGURE 3 is a plan view of the valve member; and

FIGURE 4 is a generally diagrammatic perspective view of the valve member and its seat with a sector of the valve member and its seat broken away, showing a part of the valve member and its seat in section.

In the embodiment of the invention illustrated in the drawings, I have diagrammatically shown in FIGURE 1 a scroll valve **10** including a valve seat **11** in the form of a non-rotatable disk and a valve member **12** in the form of a rotatable disk abutting the valve member seat **11** and mounted thereon for rotation with respect thereto on a pivot pin **13**, shown as being formed integrally with the valve seat **11** and as extending in an upstream direction, but which may be a separate pivot pin if desired.

As shown in FIGURES 1 and 2, the pivot pin **13** has a reduced diameter threaded outer end portion having a thrust nut **15** threaded thereon and retaining an innerface of the valve member **12** in engagement with an adjacent face of the seat **11** and in sealing engagement with an annular seal **16** recessed within the seat **11** and pressed into sealing engagement with the face of the valve member by the thrust nut **15**. Suitable locking means may be provided to lock the thrust nut **15** to the pivot pin **13**. The locking means may be of a convenional form and is no part of the present invention so need not herein be shown or described.

The seal **16** may be an O-ring type of seal made from a plastic material or a rubber or rubber-like material, a suitable sealing material affording ready rotation of the valve member being a polyurethane material.



As shown in FIGURE 1, the valve seat **11** and valve member **12** are respectively mounted in the adjacent ends of two abutting housing parts **17** and **18**. An inlet **19** leads into the housing part **18** while an outlet **20**, shown as being axially aligned with the inlet **19**, leads from the housing part **17**.

The housing part **17** is belled outwardly toward its end adjacent the housing part **18** in the general form of the frustum of a cone and terminates in an annular flange **21**. The inner marginal portion of the annular flange **21** has a shouldered recess **22** therein for receiving the valve seat **11**, which may be suitably secured thereto. An annular seal **22***a*, which may be an O-ring type of seal made from polyurethane or any other suitable material is recessed in the inner marginal portion of the annular flange **16** and pressed into engagement with the periphery of the disk forming the valve seat **11** to seal the recess **22** from the passage of fluid by the marginal portion of the valve seat **11**.

The housing part **18** is like the housing part **17** and is in the general form of the frustum of a cone terminating at its large diameter end into an annular flange **23** extending outwardly therefrom and abutting the annular flange **21** and secured thereto as by cap or machine screws **24**. The inner marginal portion of the annular flange **23** forms a shouldered recess **23***a*, within which rotates the valve member **12**. An annular seal **25**, which may be an O-ring type of seal made from polyurethane or any other suitable sealing material is seated in the shouldered portion of the recess **23***a* and has sealing engagement with the upstream face of the valve member **12**.

The valve member **12** is shown in FIGURES 1 and 2 as having worm teeth **27** extending about the periphery thereof and meshed with a worm **30**, keyed or otherwise secured to a worm shaft **31**, which may be suitably journalled in the housing part **18**. The shaft **31** and worm **30** may either be manually or hand operated. The means for operating said shaft and worm is no part of the present invention so need not herein be shown or described.

The valve member **12** is shown in FIGURE 3 as having a central open or drilled portion **32** through which the pin **13** extends and as having a spiral slot **33** etxending therethrough in an axial direction. The spiral slot **33** progresses outwardly from a position spaced closely adjacent the outer margin of the drilled portion **33** toward the periphery of the valve member and stops short of the periphery thereof.

Stiffening rods **35** extend radially through the valve member to stiffen the valve structure.

The valve seat **11** is provided with a spiral slot **36** like the slot **33** and of the same pitch and length as the slot **36**. Stiffening rods **37** extend radially through the valve seat, to stiffen the seat.

In FIGURE 4 of the drawings, the valve member **12** is shown as being in a partially closed position and a spiral land area **39** of said valve member partially laps a sprial land area **40** of the spiral slot **36**. As the valve member **12** is turned in a counterclockwise direction, the spiral land area **39** will gradually overlap the spiral slot area **36** and when said valve member has been turned for a full 180°, the spiral land area **39** will completely overlap the spiral slot area in the valve seat **12** and block the flow of fluid through the valve, as shown in FIGURE 1.

It may be seen from the drawings that the spiral slots **33** and **36** are equal, that is, are of the same pitch and length, although they need not necessarily be of the same length and that the valve member **12** moves from a full open position of the registering spiral slots **33** and **36** to a full lapping position of the land area with said spiral slots upon the rotation of the valve member **12** for one half of a revolution. The open area of the valve is therefore a

linear function of movement of the valve member relative to the valve seat, and movement of the valve member in a valve closing direction will gradually move the land area 39 over the slot area 36 to uniformly reduce the flow of fluid through the valve until the valve is in its fully closed position.

While I have herein shown and described one form in which the invention may be embodied, it may readily be understood that various variations and modifications in the invention may be attained without departing from the spirit and scope of the novel concepts thereof.

I claim as my invention:

1. A variable rate of flow shut off valve comprising two valve housing members, means securing said housing members in abutting engagement with each other, an inlet into one housing member and an axially aligned outlet leading from the other housing member, the adjacent end portions of said housing members being frusto-conical and said housing members having flanges extending outwardly of the enlarged diameter portions thereof and having abutting engagement with each other and each having an inner shouldered recess facing the next adjacent housing member, and valve means at the adjacent ends of said housing members comprising a disk seated in one shouldered recess and held from rotational movement with respect thereto, an O-ring seal sealing said disk to said shouldered recess, a second disk abutting said first mentioned disk and mounted thereon for rotational movement with respect thereto, means sealing said disks to each other comprising an O-ring seal seated in one disk and engaging the other disk, and O-ring sealing means sealing said second mentioned disk to the associated housing part, said first disk being a valve seat and said second disk being a valve member and each having a spiral passageway leading axially therethrough progressing outwardly from the center of said disks towards the periphery thereof and having a land portion defining the margin of said passageway, and means for rotating said second disk relative to said first disk to vary the lap of the land portion of one disk with respect to the spiral passageway in the other disk, and to completely cover the spiral passageway by the land portion of one disk.

2. A valve in accordance with claim 1 wherein the spirals in said disk are equal spirals and the means for rotating said second disk relative to said first disk is a worm and worm gear.




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