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Granberg

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[45] **July 2, 1974**

[54] **FLUID METER**

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[22] Filed: **Apr. 19, 1971**

[21] Appl. No.: **135,487**

Related U.S. Application Data

[63] Continuation of Ser. No. 810,710, March 26, 1969, abandoned.

[52] **U.S. Cl.** **73/260,** 418/61

[51] **Int. Cl.** **G01f 1/06**

[58] **Field of Search** 418/61, 58, 54; 73/253, 73/260; 92/89

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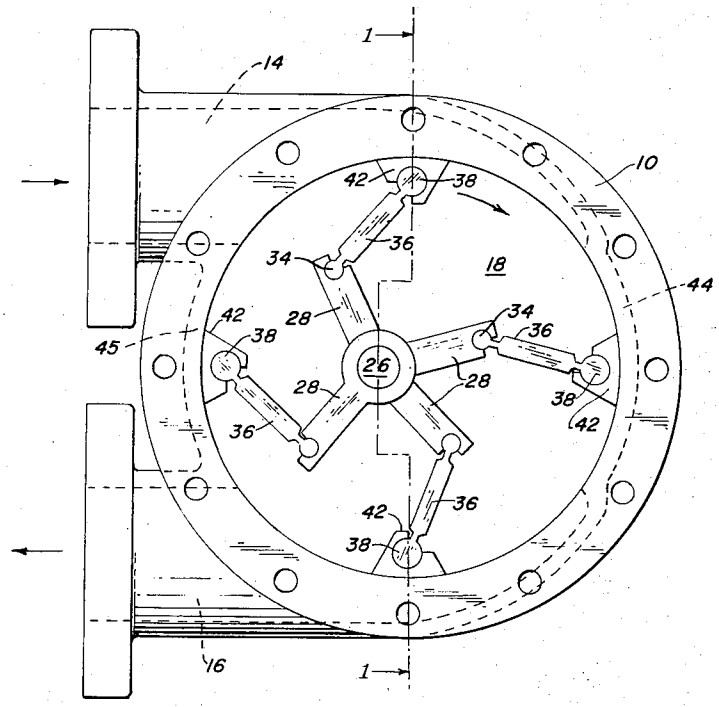
Primary Examiner—James J. Gill

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[57] **ABSTRACT**

A rotary meter which is of the vane type and in which the vanes are multiple hinged elements as distinguished from conventional sliding vanes and in which each vane is commonly journalled and extends radially from a shaft which is eccentrically disposed in a generally cylindrical housing. Each vane comprises two parts journalled together and hinged to the eccentric shaft and to one of several valving posts on a disc which rotates concentrically in the housing. This enables the vanes to change in length by virtue of their hinged construction and articulated relative to one another to form variable volume compartments through which a measured volume of liquid may be transfered from the inlet to the outlet of the meter.

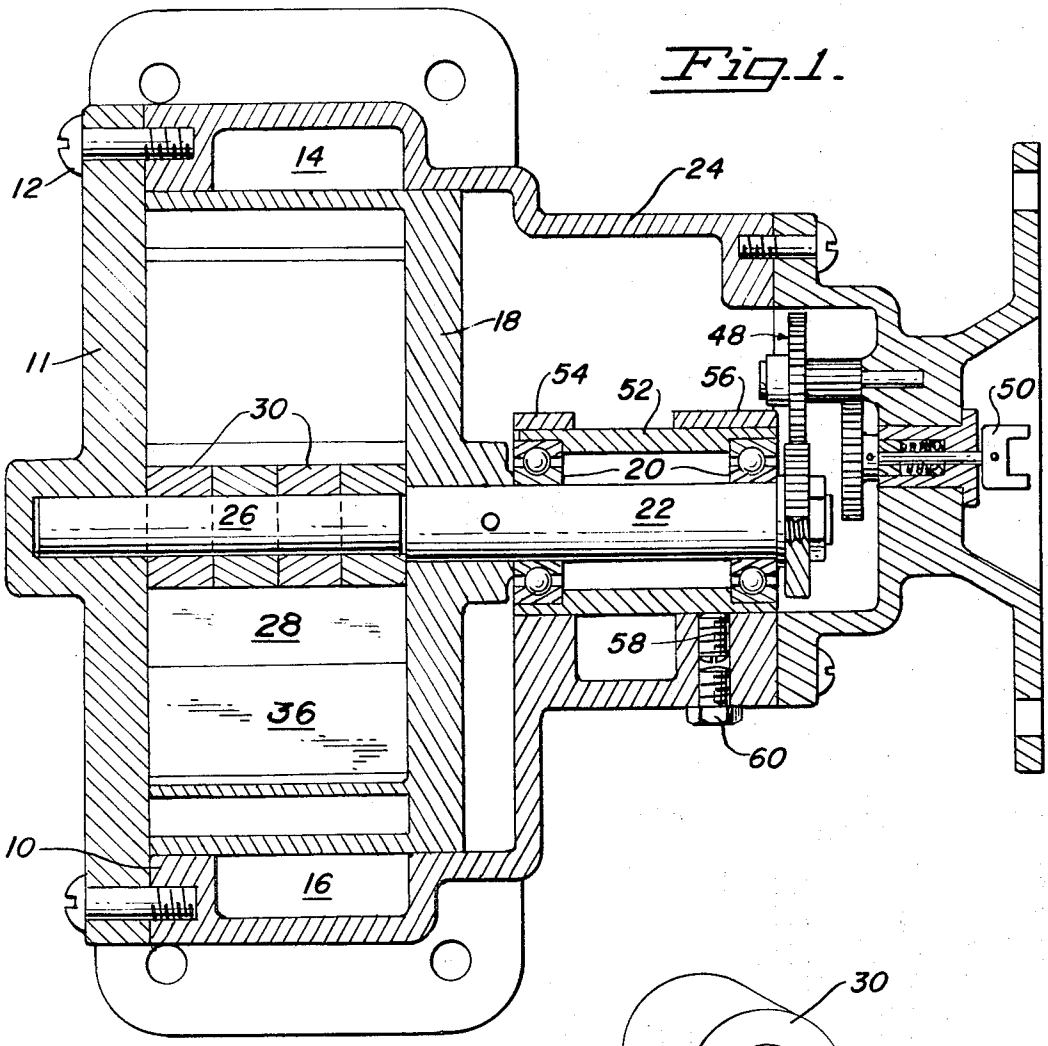
7 Claims, 5 Drawing Figures



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SHEET 1 OF 2

Fig. 1.



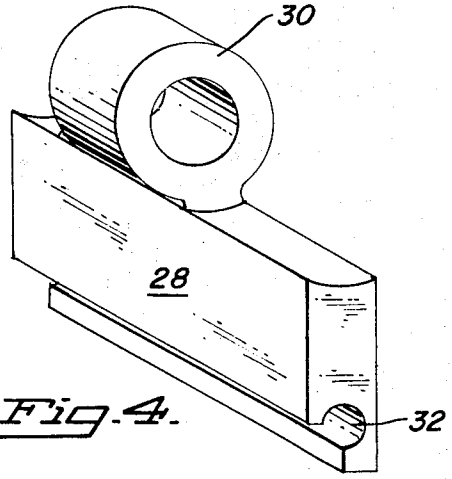


Fig. 4.

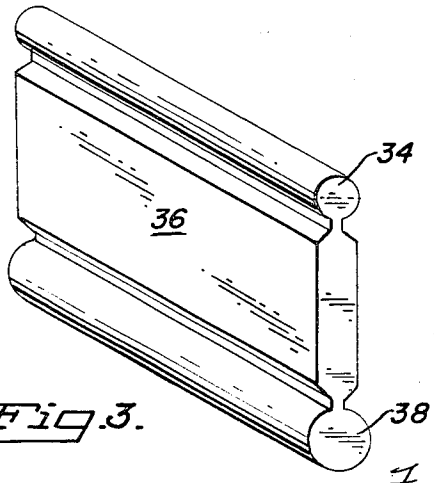
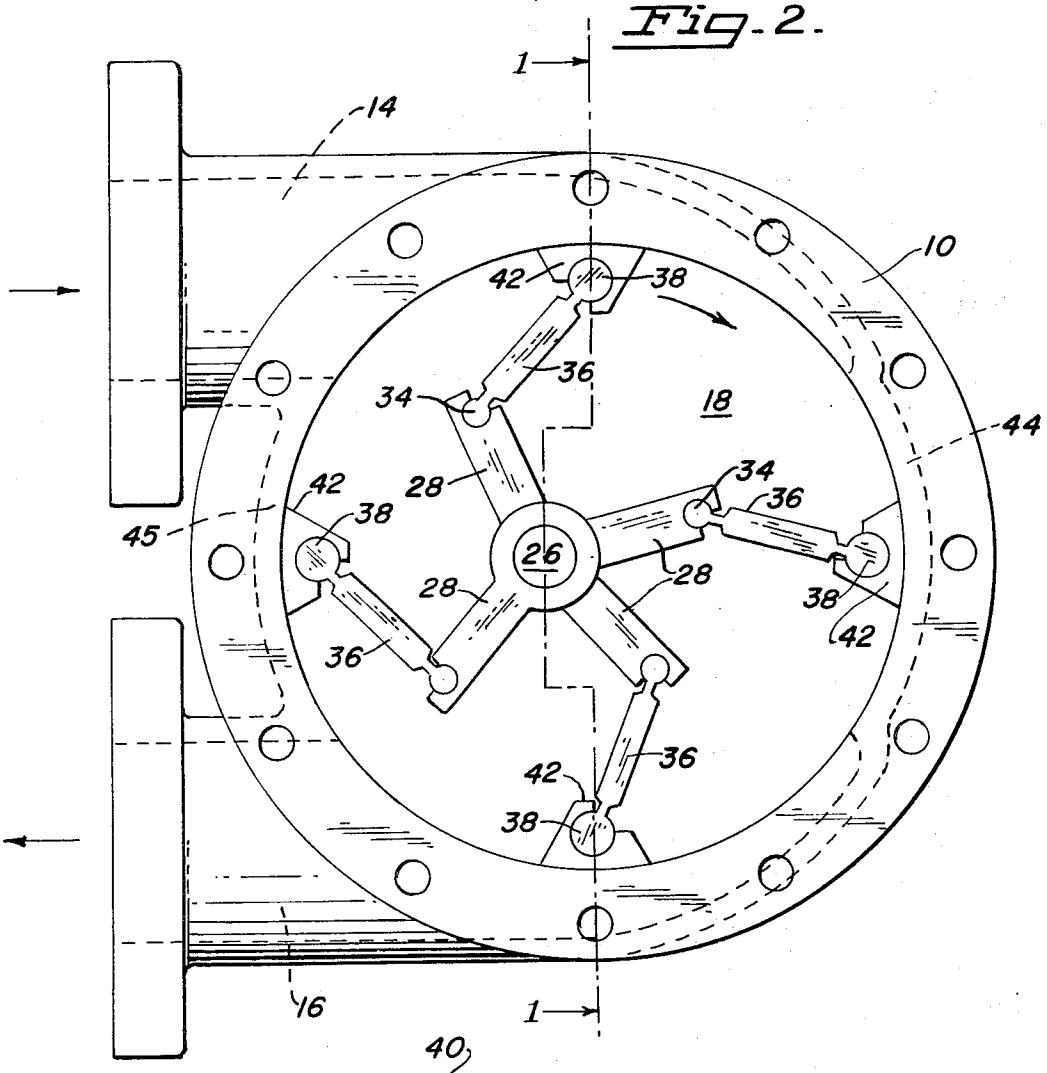


Fig. 3.

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Fig. 2.



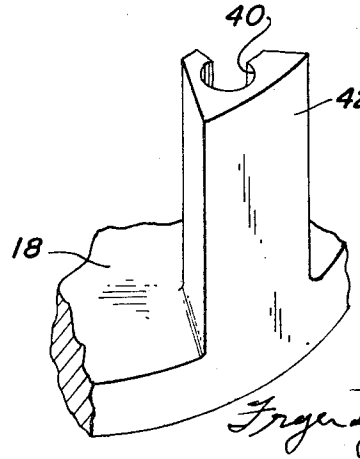


Fig. 5.

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FLUID METER

This application in a continuation of application Ser. No. 810,710 filed Mar. 26, 1969 and now abandoned.

The meter of the present invention is designed primarily for liquid petroleum products but is readily adaptable for use with various other liquids. While it operates somewhat on the principle of vane-type meters, its moving parts are considerably more free of friction and simpler to manufacture and maintain. Many other advantages will be made apparent in the following specification wherein a detailed description makes reference to the accompanying drawings.

In the drawings:

FIG. **1** is a sectional view through the meter of the present invention which is taken on the line I-I of FIG. **2**;

FIG. **2** is a view in elevation of the same meter looking from the left side of FIG. **1** with the cover of the housing removed;

FIG. **3** is an enlarged perspective view of one part of one of the hinged vanes of the meter;

FIG. **4** is a similar view of the other part of the hinged vane; and

FIG. **5** is a fragmentary perspective view showing one of four bearing posts which project from a rotatable disc and form parts of the vanes. de

Referring first to FIGS. **1** and **2**, the meter is shown as having a housing **10** with a cover **11** secured thereto as by a circle of screws shown at **12.** The interior of the main portion of the housing is cylindrical with the exception of those portions of its surface which are intercepted by an inlet passage **14** and an outlet passage **16.** That side of the housing opposite to the cover **11** is closed by a rotatable disc **18** supported by bearings **20** and a shaft **22** rotatable in the bearings disposed within a contiguous bearing and gear housing **24.**

The cover **11** supports a stub shaft **26** which, as most clearly shown in FIG. **2,** is disposed eccentrically with respect to the inner wall of the housing. This shaft **26** supports four elements **28** (see FIGS. **2** and **4**) which are the first of three parts which make up each of four articulated vanes. Each element has a bearing member **30** formed as a part thereof and the bearings are so spaced longitudinally of the four members that they combine, as best shown in FIG. **1,** to extend throughout the full width of the housing. The outer ends of the elements **28** are bored and cut away, as indicated at **32,** for the articulated reception of a pintle portion **34** (see FIGS. **2** and **3**) of a second vane part **36.** The opposite end of the vane part **36** carries another pintle part **38** which is articulately received within another cut-away bore **40** (see FIG. **5**) in a bearing post **42,** four of which are equally spaced about the periphery of the disc **18** and project longitudinally therefrom across the interior of the housing. The bearing posts **42** extend arcuately across only a minute portion of the periphery of disc element **18.** As shown most clearly in FIG. **2** of the drawings, such arcuate extension is substantially less than 45°. The axes of the hinge pintles **34** and **38** are all parallel to the eccentric shaft **26** enabling the vanes to adjust (articulate) during rotation of the disc as a variation between their end connections occurs.

With the construction just described, liquid entering the inlet **14** of the housing and passing therethrough to the outlet **16** causes rotation of the articulated vanes, the effective length of which can vary because of their

articulated construction as they pass through the space of varying width which results from the eccentricity of the shaft **26.** The shortest position of the vane is shown to the left of FIG. **2** and the longest position to the right. The interior of the housing is formed as a perfect cylinder with the exception of those portions of its wall which are intercepted by the inlet passage **14** and the outlet passage **16.** A solid portion of the wall between these passages which is shown at **44** in FIG. **2** forms a land which is at least as long as the distance between two of the bearing posts **42** and, since the outer surfaces of these posts are contoured to act as a sliding value against the inner wall of the housing, one of the articulated vanes will always serve as a barrier between the inlet passage and the outlet passage. A similar land **45** at the opposite side of the housing is always contacted by one of the vanes so that the barrier between the inlet and outlet passages is complete.

The vanes may be readily assembled by sliding them over the shaft **26** and into hinged assembly with each other without the necessity of any threaded securing means or other adjustable parts. The two articulated parts **28** and **36** are always angularly related with respect to each other in planes that converge toward the inlet or pressure side of the liquid flowing through the housing so that the pressure against them tends to straighten tne angle and thus to produce a sealing pressure between the pintles and the bores within which they are received. It can be seen in the drawings that the bore surrounds its associated pintle for more than **180°** thereby providing a sealing surface having a large surface area. Because of the eccentricity of the shaft about which the vanes are rotated, the volume of liquid not contained within a cylindrical area concentric to the shaft **26** will be caused to flow outwardly through the outlet passage **16.** Thus, the total volume of the liquid passing through the meter can be measured by counting the rotations of the shaft **22** which is driven by the liquid. That portion of the liquid within the area concentric to the shaft **26,** and which theoretically does not pass through the meter, moves with the vanes and has an inertial effect which minimizes the effect of pulsations due to opening and closing of the inlet port by the valving effect of the vanes as they rotate.

The gear train, generally indicated at **48** in FIG. **1,** transmits rotary movement of the shaft **22,** at a reduced speed, to a coupling **50** which will be connected to any suitable conventional counting or resistering mechanism to indicate the volume of liquid which has passed through the meter.

The tolerances between the rotating parts of the meter and the interior of the housing must, of course, be very close to insure accuracy. To obtain this accuracy of fit between the rotor and vanes where they contact the housing cover **11,** the bearings **20** are carried in a sleeve **52,** which is slidable in bores formed through bosses **54** and **56** within the bearing housing. The bearing assembly, including the sleeve **52,** may be fixed in its proper position by a set screw **58** which is protected by a cap screw **60.**

I claim:

1. An improved liquid meter comprising a hollow housing means having a cylindrical inner surface and having separate inlet and outlet port means in said inner cylindrical surface; said inner cylindrical surface having two separate arcuate recesses disposed axially centrally therein, one communicating with said inlet

port means and the other communicating with said outlet port means; a disc element rotatably mounted in said housing means on first shaft means, said disc element having a flat circular plate portion mounted upon said shaft means, said disc element also having valving means, said valving means including a plurality of axially extending post members formed integrally with said flat circular plate portion of said disc element and spaced circumferentially at equal intervals thereon, said post members extending arcuately along only a portion of the periphery of said circular plate portion, said post members slidingly engaging said inner cylindrical surface in a sealing relation thereto, said post members being of sufficient length to contact with portions of said inner cylindrical surface on opposite sides of said arcuate recesses; said first shaft means extending axially beyond the hollow housing means, bearing means for said first shaft means, and means for adjusting the bearing means and said disc element axially within said housing means to adjust for optimum tolerances between the moving parts of the meter; end plate means for closing one end of said housing means, said plate means including an axially inwardly directed second shaft means mounted eccentrically with respect to the rotational axis of said disc element which rotates about said first shaft means, movable vane means mounted for movement with said disc element, said vane means including a plurality of two-part vane members with opposite edges respectively slidingly engaging a face portion of said flat circular plate portion and a surface of said end plate means, each vane member having a centrally disposed articulated joint and each of said vane members having a first end portion journalled on said inwardly directed second shaft means for rotation thereabout and having a second end portion movably journalled in an associated post member of said valving means for forming a plurality of separate compartments between the vane members which have communication with said inner cylindrical surface, said inwardly directed second shaft means, said post members, said flat circular plate portion, and said end plate means; and meter registering means connected to said disc element for recording the rotational movement thereof as fluid entering said compartments through said inlet port means causes said disc element to rotate in direct proportion to fluid flowing to said outlet port means.

2. The liquid meter of claim **1** in which the articulated joint between the two-part vane members comrises a pintle member at an edge of one vane integrally formed therewith and a bore adjacent an edge of the associated vane part, said bore being slotted throughout its length to permit articulation between said vane parts.

3. The liquid meter of claim **1** further including a reduction gear train actuated by said first shaft means, and means for connecting said gear train to said meter registering means.

4. The liquid meter of claim **2** in which the vane members commonly journalled on said second shaft means for rotation have bearings embracing the said second shaft means, each bearing associated with a vane member being axially shorter than said second shaft means and variously spaced on said several vane members to be in abutting relationship when assembled upon said shaft means.

5. The liquid meter of claim **4** in which the articulated vane members are disposed with an angle between their two parts which converges toward said inlet port means whereby the pressure of liquid entering said housing means forces the joints and connections together improving their sealing capability.

6. The liquid meter of claim **1** in which the housing means include two land surfaces each of which is disposed as part of said inner cylindrical surface intermediate the end portions of said inlet port means and outlet port means which land surfaces are of sufficient arcuate extend to each receive the post member of at least one vane member at all times to prevent direct flow between said port means.

7. The improved liquid meter defined in claim **2** wherein the central articulated joint of each vane member and the connection of its opposite end portions to the inwardly directed second shaft means and associated post member respectively employ sealing means for making each resulting compartment fluid tight.

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