Oct. 30, 1956 W. ROWERDINK 2,768,528

FLOWMETER

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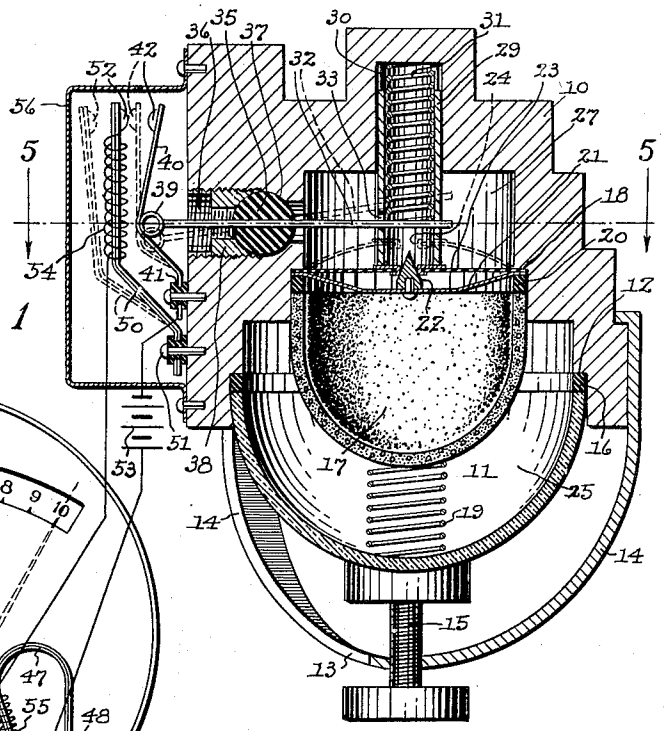
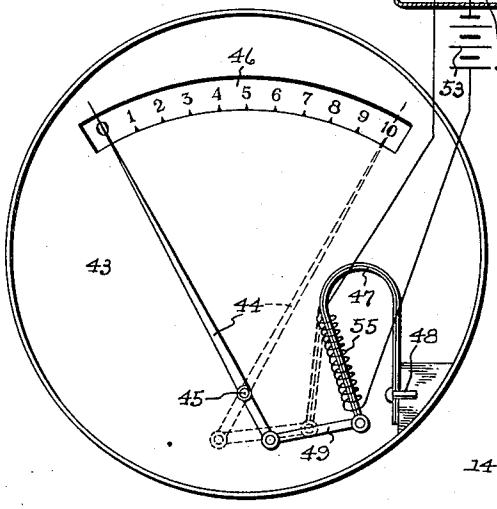


FIG. 1



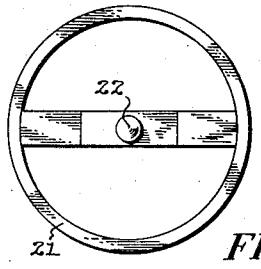


FIG. 3

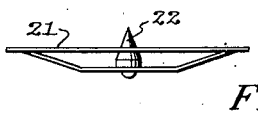


FIG. 4

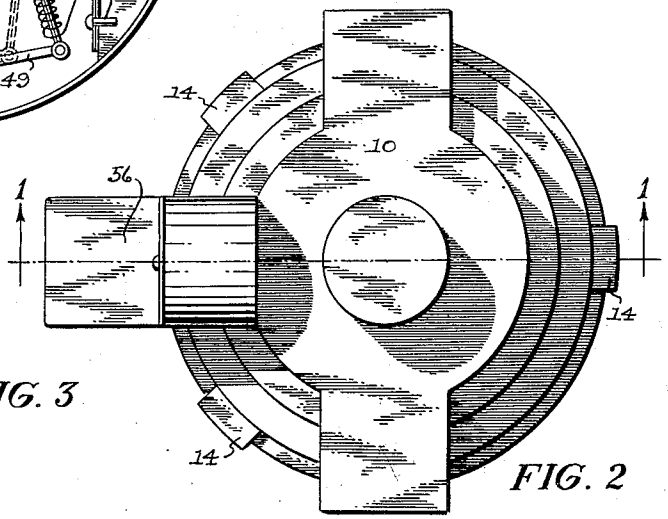


FIG. 2

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FLOWMETER

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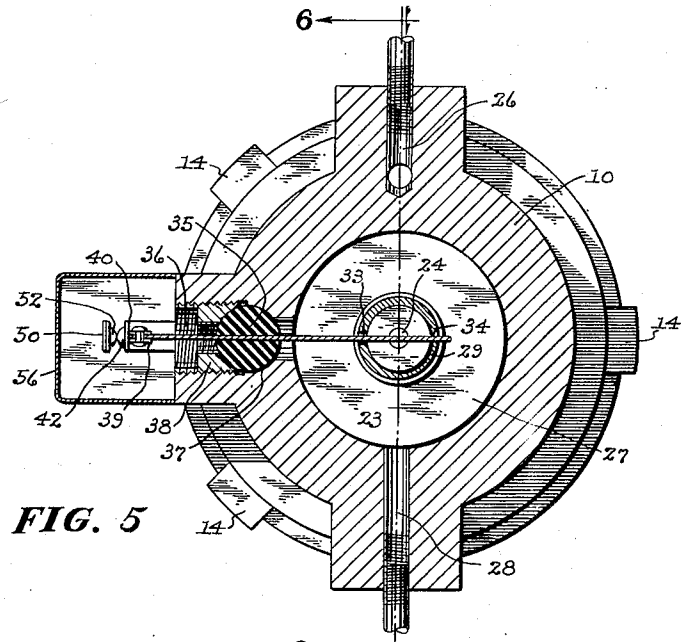


FIG. 5

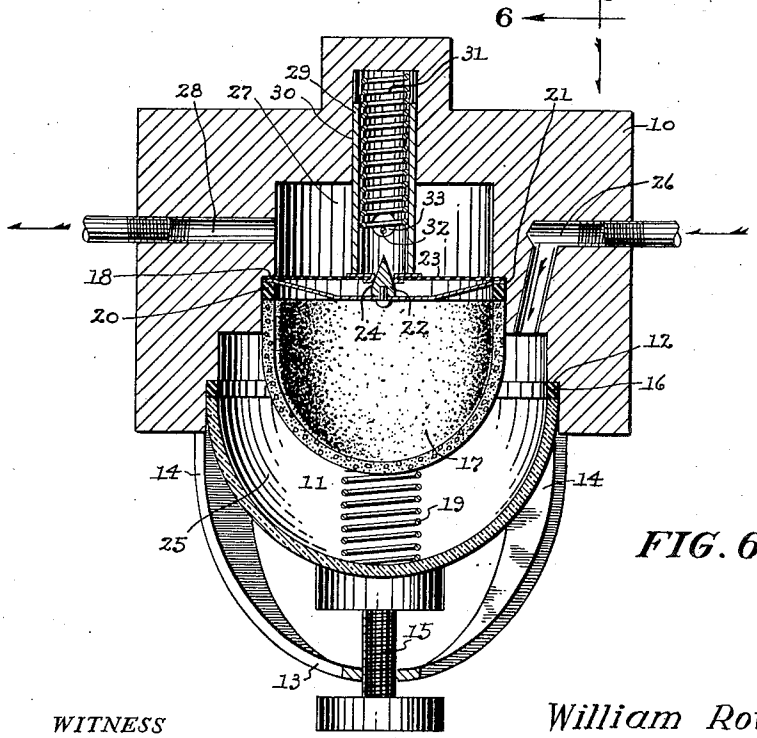


FIG. 6

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United States Patent Office 2,768,528 Patented Oct. 30, 1956

2,768,528

FLOWMETER

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Application October 25, 1954, Serial No. 464,215

3 Claims. (Cl. 73—210)

The present invention relates to fluid flowmeters and the primary objects of the invention, are to provide such a flowmeter which is improved in certain respects over the flowmeter disclosed in my Patent No. 2,273,331, issued February 17, 1942; and in general to provide a flowmeter which is efficient in its intended purpose, durable in use and reasonably economical in manufacture.

An illustrative embodiment of the invention is shown in the accompanying drawings, wherein:

Figure 1 is a central vertical cross-sectional view of the new flowmeter taken on line 1—1 of Figure 2; and showing an indicator therefor in front elevation and a connecting electrical circuit in diagram;

Figure 2 is a top plan view of the flowmeter;

Figure 3 is a top plan view of a valve stem element of the device;

Figure 4 is a side elevational view of said valve stem element;

Figure 5 is a horizontal sectional view of the flowmeter taken on line 5—5 of Figure 1; and

Figure 6 is a central vertical sectional view of the same taken on line 6—6 of Figure 5.

The flowmeter disclosed in my patent above identified had certain inherent disadvantages among which was the submersion of electrical connections in the fluid flowing through the device, resulting in the corrosion of certain electrical contacts and consequent short life of the meter. The present invention overcomes this and other disadvantages of my earlier flowmeter.

Referring now in detail to the drawings, the fluid flowmeter there shown comprises a casing consisting of an annular internally shouldered and externally stepped casting 10, and a bowl 11 of glass or other suitable material coupled to the casting 10 against its internal shoulder 12 by means of a clamp 13 having three arms 14 hooked over the stepped outer wall of the casting and provided with a screw element 15 threaded in its bottom and bearing against the bottom of the bowl 11 to clamp the latter to the casting 10. A sealing gasket 16 is interposed between the bowl 11 and the casting's shoulder 12. A cup-shaped filter 17 of porcelain or other suitable porous material is forced upwardly against the casting's internal annular shoulder 18 by means of a helical spring 19 interposed between the interior bottom of the bowl 10 and the exterior bottom of the filter 17. A sealing gasket 20 is interposed between the upper rim of the filter 17 and the shoulder 18 of the casting 10. Between this gasket 20 and the internal annular shoulder 18 on the casting 10, there is interposed a ring-shaped valve stem element 21 (see Figures 3 and 4) having a central conical valve stem 22 mounted on a cross-bar on the element 21, and a flexible diaphragm 23 having a central aperture therethrough with an annular valve seat member 24 therein cooperable with the valve stem 22. This flexible diaphragm 23 divides the interior of the casing into a lower inlet chamber 25 having a fluid inlet port 26 (see Figures 5 and 6) and an upper outlet chamber 27 having a fluid outlet port 28.

It will be seen that when fluid is admitted to the lower inlet chamber 25, which includes the interior of the filter 17, pressure is built up within said inlet chamber 25 until it is great enough to flex the diaphragm 23 upwardly as indicated in dotted lines in Figure 1, whereupon the valve seat member 24 is unseated from the valve stem 22 and the fluid is permitted to flow through the opened valve into the upper outlet chamber 27 and out of the casing through the outlet port 28.

Upward flexing of the diaphragm 23 also moves upwardly a sleeve member 29 which is vertically slidably disposed in a cylindrical slide bearing 30 in the upper part of the casting 10 and which bears at its lower end against the valve seat member 24. A helical spring 31 normally urges the sleeve member 29 downwardly and thus urges the valve toward closed position, said spring 31 bearing at its upper end against the casting 10 and at its lower end against the inner end of a bar 32 which passes through aligned apertures 33 and 34 in the wall of the sleeve member 29 at diametrically opposite points.

The bar 32 passes through a spherical resilient plug 35 and is desirably vulcanized thereto intermediate said bar's inner and outer ends. (See Figures 1 and 5.) The resilient plug 35 is seated in an opening 36 through the wall of the casting 10 and is securely pressed against a spherically formed shoulder 37 in the opening 36 by means of a collar 38 threaded in the outer portion of the opening 36 and tightened against the plug to thus seal the opening 36 against any possible leakage of fluid therethrough. The bar 32 is angularly reciprocable in a vertical plane with the plug 35 serving as a fulcrum for the bar's reciprocable movement. The outer end of the reciprocable bar 32 passes freely through the collar 38 and is provided with a wheel 39 which bears against a flexible electrical switch arm 40 mounted at 41 on the exterior of the casting 10 and provided with a contact 42 on its outer end.

An indicator 43 shown in Figure 1 has a pointer 44 pivoted at 45 and a graduated scale 46 for indicating fluid flow and fluctuations therein. A thermostatic bimetal arm 47 is mounted at 48 in the indicator 43 and is operatively connected to the pointer 44 by means of a pivoted link 49. A second thermostatic bi-metal arm 50 is mounted at 51 on the exterior of the casting 10 and is provided with an electrical contact 52 on its outer end which is adapted to be engaged by the contact 42 on the switch arm 40 whenever the latter is flexed outwardly by increased fluid pressure in the casing.

The electrical circuit of the device through the battery 53 includes the switch arm 40, the second thermostatic arm 50 and portions 54, 55 coiled around the thermostatic arms 50 and 47 respectively for heating and thereby flexing said arms by the resistance of said coiled portions to current passing therethrough.

If desired the switch arm 40 and the thermostatic arm 50 may be protected from dust and dirt by a sheet metal housing 56 secured to the exterior of the casting 10 as shown.

Operation

Fluid enters the flowmeter through the inlet port 26 and passes into the inlet chamber 25 where it builds up sufficient pressure to flex the diaphragm 23 upwardly and open the valve 22, 24, the fluid then flowing through the outlet chamber 27 and outlet port 28. This upward flexing of the diaphragm 23 moves sleeve 29 and the inner end of the reciprocable bar 32 upwardly against the force of spring 31. The bar 32 being fulcrumed in the resilient plug 35, its outer end is moved downwardly thus flexing the switch arm 40 outwardly to complete the electric circuit through this switch arm 40, through contacts 42, 52, and through coiled portions 54, 55 around the thermostatic bi-metal arms 50, 47 respectively. Bi-metal arm 47 of the indicator 43 is thus heated and flexed toward its

dotted line position thus to turn the pointer **44** and indicate increased fluid flow. If the flow through the casing be now constant the positions of the diaphragm **23**, sleeve **29**, bar **32** and switch arm **40** remain unchanged; but when the coiled portion **54** heats sufficiently to flex the bi-metal arm **50** on the exterior of the housing and separate the contact points **42, 52** to thus open the circuit, this bi-metal arm **50** cools and flexes inwardly so that the points **52, 42** again contact thus again moving the pointer **44** to increasing flow-indicating position. The points **42, 52** thus engage and separate intermittently and frequently with considerable rapidity, for actuating the pointer to indicate the fluid flow.

It will be seen that the opening **36** through the casing is efficiently sealed against leakage of the fluid from the casing, by the resilient plug **35**, while at the same time the resilience of the plug permits reciprocation of the bar **32** which passes through the plug and through the opening **36**.

While but one specific embodiment of the invention has been herein shown and described, it will be understood that numerous details thereof may be altered or omitted without departing from the spirit of the invention as the same is defined by the following claims.

I claim:

1. A flowmeter comprising: a casing having a fluid inlet port and a fluid outlet port and a valve stem therein; a flexible diaphragm dividing the interior of the casing into an inlet chamber and an outlet chamber, said diaphragm having an aperture therethrough with a valve seat therein cooperable with said valve stem, the diaphragm being movable toward valve-opening position by fluid pressure in the inlet chamber; a plug seated in an opening through a wall of the casing and sealing said opening; a bar passing through said plug and angularly reciprocable in a vertical plane with said plug serving as the fulcrum for the bar's reciprocable movement, the inner end of said bar being operatively connected to the diaphragm; an indicator having a turnable pointer; a bi-metal thermostatic arm operatively connected to the pointer; a second bi-metal thermostatic arm mounted exteriorly of the casing and having an electrical contact thereon; a switch arm mounted exteriorly of the casing and having an electrical contact thereon, said switch arm bearing against the outer end of said reciprocable bar and movable by increased fluid pressure in said inlet chamber into circuit-closing engagement with the second thermostatic arm; and an electrical circuit including the switch arm and the second thermostatic arm and portions coiled around said thermostatic arms respectively for heating and thereby flexing the same by the resistance of said coiled portions to the current passing therethrough, the first thermostatic arm thus flexed turning the pointer to indicate increased fluid flow, and the second thermostatic arm thus flexed moving alternately between circuit-opening and circuit-closing association with the switch arm in response to the heating and cooling phases respectively of said second thermostatic arm.

2. A flowmeter according to claim 1 characterized by having the plug molded of resilient material.

3. A flowmeter according to claim 1 characterized by having the plug molded of resilient material vulcanized on the reciprocable bar.

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