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(54) IMPROVEMENTS IN OR RELATING TO FLOW METERS

(71) We, GERVASE INSTRUMENTS LIMITED, a British Company of Britannia Works, Cranleigh, Surrey, GU6 8ND, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed to be particularly described in and by the following statement:—

This invention relates to a device for measuring the rate of flow of a fluid in a conduit. More particularly it relates to a device having an orifice through which the fluid passes, thereby causing a differential pressure across the orifice.

It is already known to provide means for varying the effective area of the orifice. Meters having such means are, for example, described in the British Patent Specification No. 1,190,912. Therein the measuring orifice has an effective area which is related to the axial position of an orifice plug relative to the orifice. This axial position is dependent upon the differential pressure across the orifice, there being a control member provided which is coupled to the orifice plug and which is subjected to the differential pressure.

A fluid flow meter according to the present invention comprises a flow tube having fluid flow input and fluid flow output means, said tube having a peripheral wall defining a generally circular flow cross-section, wherein within said tube and between said input and output means is a round measuring orifice, and slidably mounted on an axial slide in said orifice is a contoured plug of curvilinear tapering cross-section, the curvature of the contouring being such as to produce a linear relationship between differential pressure across an annulus formed by the coincidence of the plug and the orifice and between the flow rate through the annulus, spring biasing means urging said plug so as to close said orifice and wherein fluid flow indicating means serves to indicate the fluid flow through said flow tube.

By arranging for the area of the orifice to vary as a function of the fluid flow rate values for the fluid flow rate may be derived directly from a reading of the differential pressure generated across the orifice without recourse to further calibration.

The invention is further described by way of example with reference to the accompanying drawings wherein:

Figure 1 shows schematically a flow meter according to the invention, and

Figure 2 shows a modified form of the orifice plug.

Referring now to the Figures, the flow meter comprises a tube 1 having flanges 2, 3 respectively at the inlet and outlet for insertion in a pipe line.

Fixed to the internal wall of the tube is a concentric orifice plate 4. Downstream of the orifice is a spindle support 5 fixed to the internal wall of the pressure vessel. The support holds a longitudinal shaft 6 on which an orifice plug 7 in the form of a contoured cone is slidingly mounted. Plug 7 is biased towards the inlet end of shaft 6 by spring 8, so as normally to close the orifice. Tappings 9, 10 respectively in the inlet and outlet conduits are provided to enable the differential pressure across the orifice to be measured by means of a manometer or the like.

In operation the fluid flow energy moves the orifice plug 7 along the shaft 6 towards the outlet and against the restraint of the spring 8 until a suitable flow annulus is created between the fixed orifice and the concentric contoured side of the plug thus allowing the fluid to pass through the device without further movement of the plug.

At any one position of the plug relative to the orifice the fluid flow (Q) will be equal to constant (K_1) times the area (A) of the annulus times the square root of the differential pressure (H) measured across the annulus.

This is restated in the formula:

$$Q = K_1 A \sqrt{H}$$

The contoured surface of the plug 7 is shaped so that as the plug travels against the spring along the longitudinal support the annular area between contoured surface and orifice varies directly as the square root of the differential pressure across the annulus.

This is restated in the formula:

$$A = K_2 \sqrt{H}$$

combining these two equations gives:–

$Q = K_3 H$ where $K_3 = K_1 \times K_2$ and is therefore a constant.

The device therefore comprises a linear flow rate meter where the flow rate is directly proportional to the differential pressure generated across the plug/orifice.

Using a double profiled plug as shown in Figure 2, the device may be constructed as a bi-directional flowmeter capable of measurement of flow rate in reverse direction.

WHAT WE CLAIM IS:–

1. A fluid flow meter comprising a flow tube having fluid flow input and fluid flow output means, said tube having a peripheral wall defining a generally circular flow cross-section, wherein within said tube and between said input and output means is a round measuring orifice, and slidably mounted on an axial slide in said orifice is a contoured plug of curvilinear tapering cross-section, the curvature of the contouring being such as to produce a linear relationship between differential pressure across an annulus formed by the coincidence of the plug and the orifice and between the flow rate through the annulus, spring biasing means urging said plug so as to close said orifice and wherein fluid flow indicating means serves to indicate the fluid flow through said flow tube.

2. A fluid flow meter as claimed in Claim 1 wherein the plug has two said curvilinear tapering cross-sections facing opposite directions whereby said inlet may be at either end of the flow tube.

3. A fluid flow meter as claimed in Claim 1 wherein the orifice is provided with a tapering cross-section narrowing towards said output.

4. A fluid flow meter substantially as described with reference to the accompanying drawings.

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1566251 COMPLETE SPECIFICATION

1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

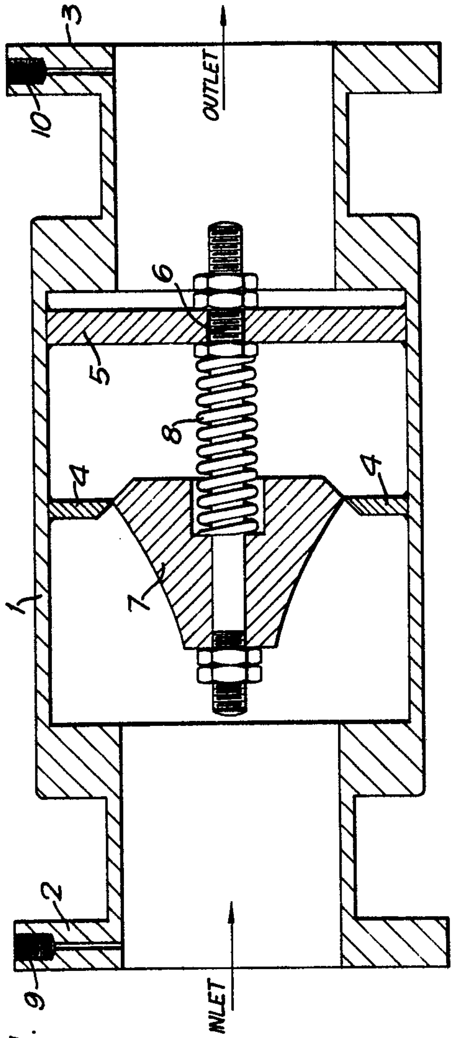

Fig.1.

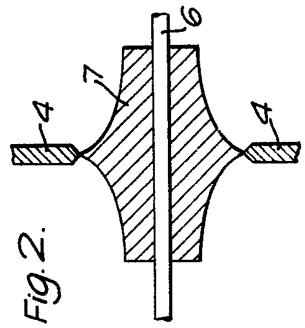

Fig.2.