

Abstract

Provided is an improved pressure-type flow rate control apparatus that can control the flow rate of a fluid with great precision using an empirical formula. The empirical formula can provide values that closely fit with the actual flow rates of a compressible fluid under non-critical conditions.

The improved pressure-type flow rate control apparatus can control the flow rate of fluid passing through an orifice 4 to a target flow rate with accuracy and at a high speed. The empirical formula for the compressible fluid under non-critical conditions (sub-sonic) is expressed as $Q_c = KP_2^m(P_1 - P_2)^n$ and the flow rate of fluid passing through orifice 4 is calculated by:

$$Q_c = KP_2^m(P_1 - P_2)^n$$

(K is a proportional constant; and m and n are constants)

so that the flow rate of fluid passing through the orifice 4 can be controlled to the target flow rate with high precision at a high speed.

Also provided is an improved pressure-type flow rate control apparatus in which a pressure ratio $P_2/P_1 = r$, obtained from an upstream pressure P_1 and a downstream pressure P_2 is constantly compared with a critical value r_c , and under critical conditions ($r \leq r_c$), the flow rate is calculated by :

$$Q_c = KP_1.$$

Under non-critical conditions ($r > r_c$), the flow rate is calculated by $Q_c = KP_2^m(P_1 - P_2)^n$, so that the flow rate is controlled to the target flow rate with accuracy at a high speed depending upon the conditions of fluid



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