NEW PIEZOELECTRIC VALVE WITH HIGH ACCURACY AND SMALL RESPONSE TIME FOR WORK IN REAL-TIME

Description

A motorized control valve is developed to regulate any kinds of liquids, steam, gas or vacuum streams. It can be used in energy industry, chemical industry, food industry etc. At the basis of the piezoelectric control valve is a special piezoelectric mechanism which, on one hand, allows very fast action (analogous to the cut-off valve), and on the other hand, it allows very precise control (analogous to the controller valve). At the present time these two valves work separately complementing each other. Our single valve can replace either one of them, or both. The suggested piezoelectric valve is intended for using simultaneously as a fast valve with working time less than one second (open up to 900), as well as a precise valve with high angular resolution (minimum angular increment ~ 1 arc-sec, response time~ 50μs). In case a piezoelectric valve is jammed, the piezoelectric mechanism, unlike an ordinary electric motor, will not burn itself out. The piezoelectric valve, unlike an ordinary motor, also generates no sparks.

Innovative Aspect and Main Advantages

Generally, a control valve comprises three primary components: a valve, (such as a ball valve,) a DC motor and a control circuit (see control valves manufactured by companies such as Siemens, Johnson Controls, Sauter, Danfoss, Belimo, Joventa). Such control valves are characterized by low speed (duration of "closed-open" mode ranges from 30 to 140 seconds), low resolution (1-5 angular degrees), a response time of 1-2 seconds, high weight (1-2 kilograms) and high cost ($ 400 – for a valve with resolution 1-5 ang. degrees; $1000 for a valve with 0.2 – 1.0 angular degree resolution). The suggested valve will be an inexpensive noiseless piezoelectric valve with high speed (duration "closed-open" mode less than 1 second), high resolution (less than 1/3600 angular degree or 1 arc-sec), rapid response time (1/20000 second or 50μs), and low weight (50 -300g without the ball) – all in one product.

Technical data for computerized piezoelectric ball valve (fig.1) for a S" (half-inch) pipe

Working time (duration "closed-open" mode, angular range 00-900)	< 0.5 s
Angular resolution (min. angular increment)	1 arc-sec
Response time	50μs
Weight (with the S" valve)	250g
Voltage	12V
Maximum Power Consumption (duration of the working time)	4-6 W

Areas of Application

Such a valve will find use in all systems in the world, which contain tubes: steam heating, water pipelines, gas pipelines, oil pipelines, power reactors, chemical reactors, power motors, vacuum systems, etc. The Piezoelectric valve will enable development of a new generation of power systems (engines of internal combustion, turbojets, steam and gas generators, nuclear reactors), various hydraulic systems with small response times and with high control accuracy. Thus, "thermo-gas- hydraulic" systems working in real time, with speed approaching that of electronic systems, can be developed. In addition to the broader industrial uses described above, the piezoelectric valve offers significant commercial potential at an individual household level, by reducing the risk of spark and explosion.

Fig.1 Computerized piezoelectric ball valve for a S"

Different schemes of piezoelectric valves

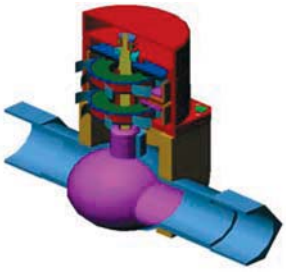

Fig.2 Single direction control valve

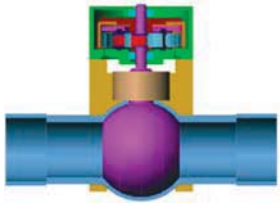

Fig.3 Reverse direction control valve

Stage of Development

LILEYA's unique designs is being patented :

- in United States (U.S. Serial No 11/406,335)
- in the World (PCT/UA2006/000067)
- in Ukraine (Application Serial N 2006 11804)

LILEYA builds valves with superior high performance characteristics and it can produce 1000-10000 valves in years now, larger production possible.

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