PIEZOELECTRIC VALVE

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 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, as well as a precise valve with high angular resolution (minimum angular increment ~ 1 arc-sec, response time - 50us)

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 Aspects 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 ang. 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 1/3,600 angular degree or 1 arc-sec), rapid response time (1/20,000 second or 50us), and low weight (250 -300g) - all in one product.

Technical data for piezoelectric ball valve for a S" (half-inch) pipe:

- Working time (duration "closed-open" mode) ........... < 1s
- Angular resolution (min. angular increment) ........... 1 arc-sec
- Response time .................................................. 50us
- Weight (with the S" valve) .................................. 250g
- Voltage .............................................................. 12V
- Power ............................................................... 4-6 W

Fig. 1. Piezoelectric ball valves for a S" (half-inch) pipe and a 1" (inch) pipe.

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, and 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. The valve would enable precise regulation of household water supply and household heat supply with a noiseless, small-sized, energy-efficient, and simple to control element. In particular, the Piezoelectric Valve could offer a significant safety improvement on existing systems for regulating household gas supply, by reducing the risk of spark and explosion.

Stage of development
LILEYA's Piezoelectric Valve is being patented in UA and USA. LILEYA can produce 500-1000 Piezoelectric Valve in years.

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