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FLUIDIC DIODE OR SENSOR DEVICE

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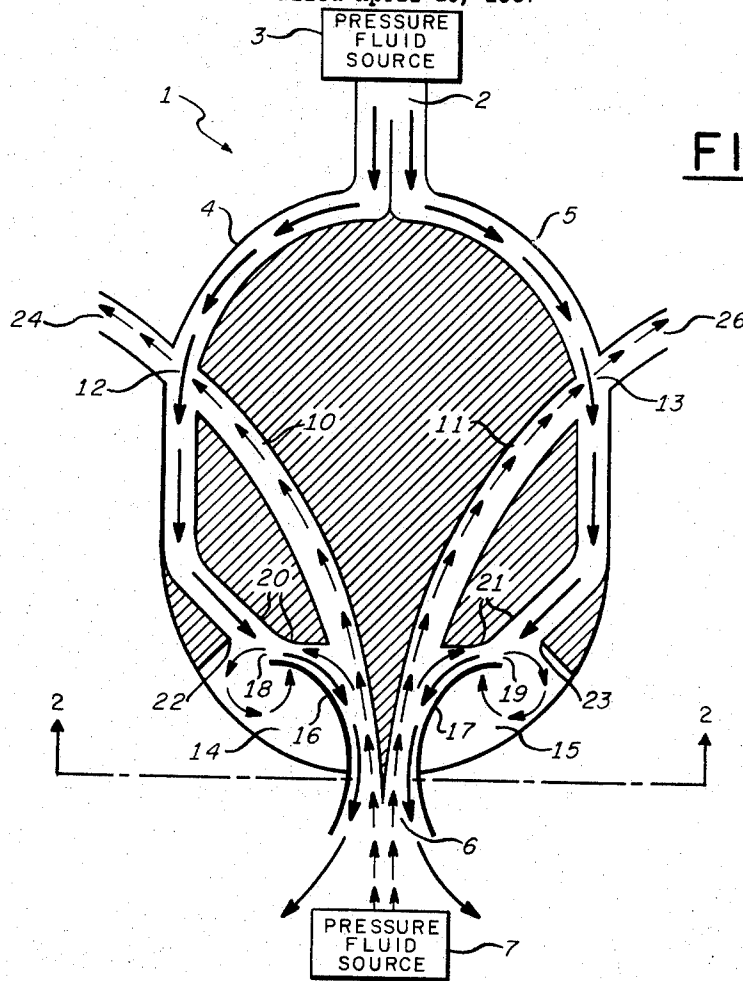


FIG. 1.

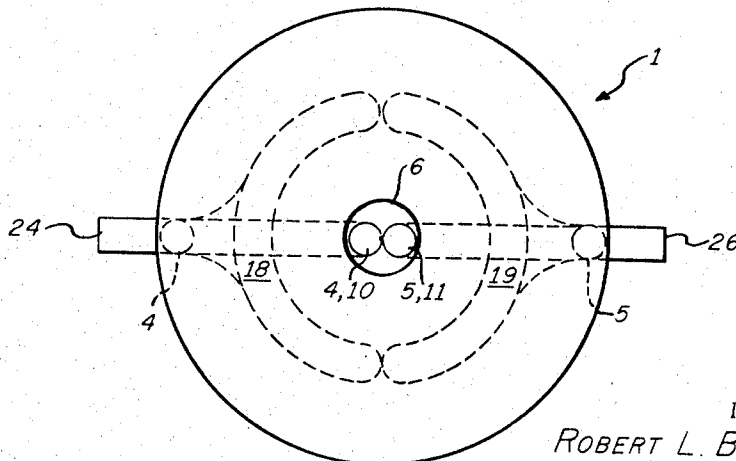


FIG. 2.

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FLUIDIC DIODE OR SENSOR DEVICE

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6 Claims

ABSTRACT OF THE DISCLOSURE

A fluidic device which functions as a fluidic diode having no moving parts with a high output in the preferential direction and substantially no output in the opposite direction which may be used alternatively as a sensing device.

BACKGROUND OF THE INVENTION

Field of the invention

The present invention pertains to fluidic logic devices and particularly to those functioning as diodes or sensors.

Description of the prior art

Prior art fluidic diodes generally are either relatively complex, utilize moving parts, have a relatively high failure rate or exhibit low efficiency in that there is substantial flow of fluid in the back direction.

SUMMARY OF THE INVENTION

The present invention provides a fluidic diode or sensor which is relatively small, inexpensive, has no moving parts and enjoys exceptionally high efficiency providing extremely high flow in the preferential direction and substantially no flow in the back direction. It also provides positive operation in a closed system. Further, it is not affected by environments which render equivalent electronic devices inoperative.

BRIEF DESCRIPTION OF THE DRAWING

Referring now to the drawing,

FIG. 1 is a front cross-sectional view of a fluidic device constructed in accordance with the present invention; and FIG. 2 is a bottom view of the fluidic device of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIGS. 1 and 2, a fluidic device 1 has an input conduit 2 connected to a source of pressure fluid 3. The input conduit 2 is divided into bifurcated conduits 4 and 5. The conduits 4 and 5 define a portion of the external surface of the fluidic device 1 and tend to converge to form a single output conduit 6 which may be connected to one or more utilization devices not shown. Another pressure fluid source 7 for providing pressure fluid in the opposite direction is connected to the output conduit 6. The conduit 6 has two channels 10 and 11 which are disposed inwardly of the conduits 4 and 5. The conduits 10 and 11 gradually flare outwardly to intersect conduits 4 and 5 at crossovers 12 and 13, respectively. Vortex chambers 14 and 15 are disposed to be cooperative with the channels 10 and 11, respectively, as well as adjacent the conduits 4 and 5, respectively. To achieve cooperation of the channel 10 with the vortex chamber 14, the outer wall 16 of the conduit 10 is gradually curved to communicate with the vortex chamber 14 and similarly an outer wall 17 of the conduit 11 is gradually curved to communicate with the vortex chamber 15. The outer wall portions 16 and 17 also form portions of the outer wall of the conduits 4 and 5. The openings 18 and 19 to the vortex chambers 14 and 15 provide discontinuities in the outer walls of the conduits 4 and 5, respectively.

In operation, with pressure fluid from the source 3 applied to the input conduit 2, the fluid travels downwardly through the input conduits 4 and 5, as shown by the heavy arrows, passing the crossovers 12 and 13. The flow through the conduits 4 and 5 attaches to the shoulders 20 and 21, respectively, because of the Coanda effect which provides a stable dynamically formed and sustained pressure gradient across each stream to keep it affixed to its adjacent boundary. The attachment of the stream to its adjacent boundary is sustained by the action of the stream in entraining air into the stream. Near the adjacent wall, the entrained air cannot be replaced, resulting in the dynamic effect of pressure reduction in the boundary layer. On the opposite side of the stream, where there is no close interference of a boundary, fluid is more freely replaced as the stream entrains the nearby fluid. The net effect is to provide a transverse pressure gradient across the stream and to keep it flowing next to the adjacent wall at the respective shoulders 20 and 21. This effect is further enhanced by providing the discontinuities 18 and 19 in the outer walls of the conduits 4 and 5, respectively, as well as the vortex chambers 14 and 15. The attachment of the fluid to the surfaces 20 and 21 guides the fluid through the conduits 4 and 5 to the output conduit 6.

The fluid in the conduit 4 does not tend to attach to the side of the conduit associated with the vortex chamber 14 because in effect the fluid sees the discontinuity 18 between the end of the outer portion of the conduit 4 at point 22 and the curved wall 16. Similarly, the fluid in the conduit 5 sees the discontinuity between the end of the outer portion of the conduit 5 at point 23 and the curved wall 17.

Flow in the reverse direction from the pressure fluid source 7 tends to flow as shown in the direction of the light arrows. A large portion of the fluid flow from the source 7 is directed through the venting channels 10 and 11 and past the crossovers 12 and 13, respectively, to be vented to the atmosphere, for example. The remaining portion of the fluid from the source 7 is divided into two parts. One portion is directed along the curved outer portions 16 and 17 into the vortex chambers 14 and 15, respectively, where turbulent flows are established to dissipate the energy of that portion of the fluid. The other portion of the fluid is directed along the input conduits 4 and 5 adjacent the shoulders 20 and 21 until it reaches the crossovers 12 and 13, respectively. Then, the relatively large flow through the conduits 10 and 11 tends to attract the flow through the conduits 4 and 5 to merge and thereby dissipate the total flow to the atmosphere via the extremities 24 and 26, respectively.

Alternatively, the fluid device 1 may function as a sensor, for example, to control the level of a liquid in a tank (not shown). In this event, the extremity 24 of the conduit 10, which is normally vented to the atmosphere, is closed while the extremity 26 of the conduit 11 is connected to be cooperative with the liquid whose level is to be controlled. The fluid flow through the fluid device 1 is then provided by the pressure fluid source 7. The fluid flows through the conduit 11 and is vented to the atmosphere when the liquid level is not high enough to block the extremity 26. When the liquid level reaches the height of the extremity 26 thereby blocking the fluid from escaping therefrom, the fluid is diverted to flow out the conduit 5 which activates other apparatus (not shown) to prevent any additional liquid from being added to the tank. In this way, the liquid level in the tank may be accurately maintained at a level determined by the location of the extremity 26 within the tank.

While the invention has been described in its preferred embodiments, it is to be understood that other embodiments are made possible without departing from the true

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scope and spirit of the invention in its broader aspects.

What is claimed is:

1. A fluid device comprising, an inlet, an outlet, a first fluid conduit means for coupling said inlet to said outlet and for providing an easy fluid flow path from said inlet to said outlet, a second fluid conduit means branching from said first conduit means at a point intermediate said inlet and outlet, said second conduit means extending to said outlet and merging with said first conduit means at said outlet, vent means communicating with said first conduit means at a point opposite the point said second conduit means branches from said first conduit means, said second conduit means providing an easy flow path for fluid flowing from said outlet to said vent means whereby fluid tending to flow from said outlet to said inlet is caused to exhaust out said vent means.

2. A device of the character described in claim 1 wherein a fluid energy dissipating cavity means communicates with the first conduit means at a point intermediate the outlet and the branch point of said first and second conduit means.

3. A device of the character described in claim 2 wherein said cavity means is a vortex chamber.

4. A device of the character described in claim 3 wherein said vortex chamber communicates with said first conduit means through an aperture formed in the wall of said first conduit means and wherein the wall portion adjacent said aperture is shaped so that fluid moving from said outlet toward said inlet induces a vortex in said

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vortex chamber while fluid flowing from said inlet toward said outlet bypasses said vortex chamber.

5. A fluid device of the character described in claim 1 wherein the first conduit means comprises a pair of conduits that merge at the inlet and again at said outlet and separate into distinct fluid conduits between said inlet and said outlet, and said second conduit means comprises a first fluid path extending from one of said pair of conduits to said outlet and a second fluid path extending from the other of said pair of conduits to said outlet.

6. A fluid device of the character described in claim 5 wherein a separate vortex chamber communicates with each of said pair of conduits at a point between said outlet and the respective branch points for said first and second fluid paths.

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