March 24, 1970 H. J. LESKIEWICZ 3,502,093

MULTIFUNCTION LOGICAL JET ELEMENT

Filed Jan. 12, 1966 2 Sheets→Sheet 1

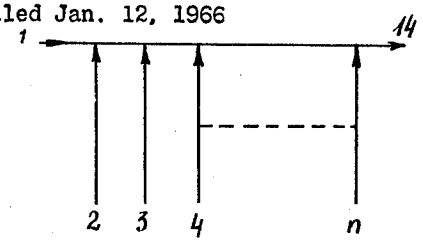

Fig. 1

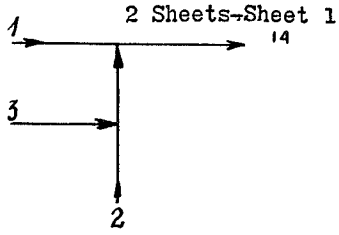

Fig. 2

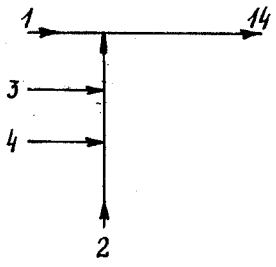

Fig. 3

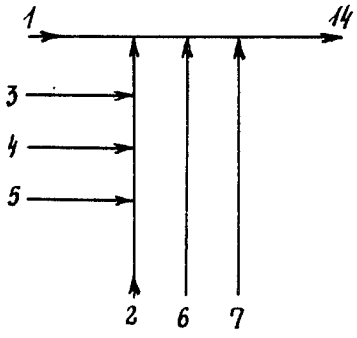

Fig. 4

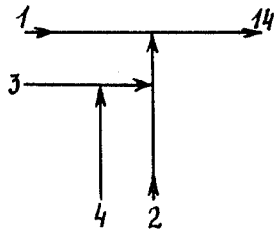

Fig. 5

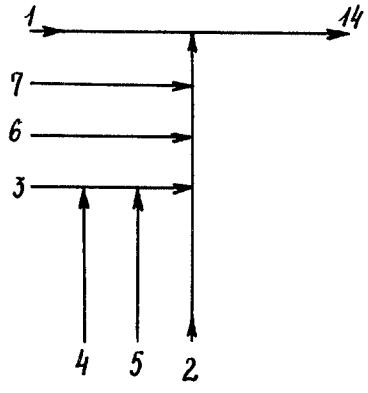

Fig. 6

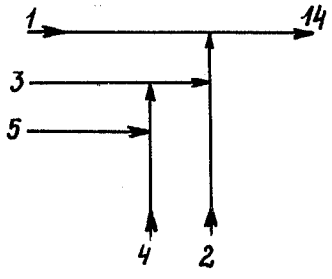

Fig. 7

March 24, 1970 H. J. LESKIEWICZ 3,502,093

MULTIFUNCTION LOGICAL JET ELEMENT

Filed Jan. 12, 1966 2 Sheets-Sheet 2

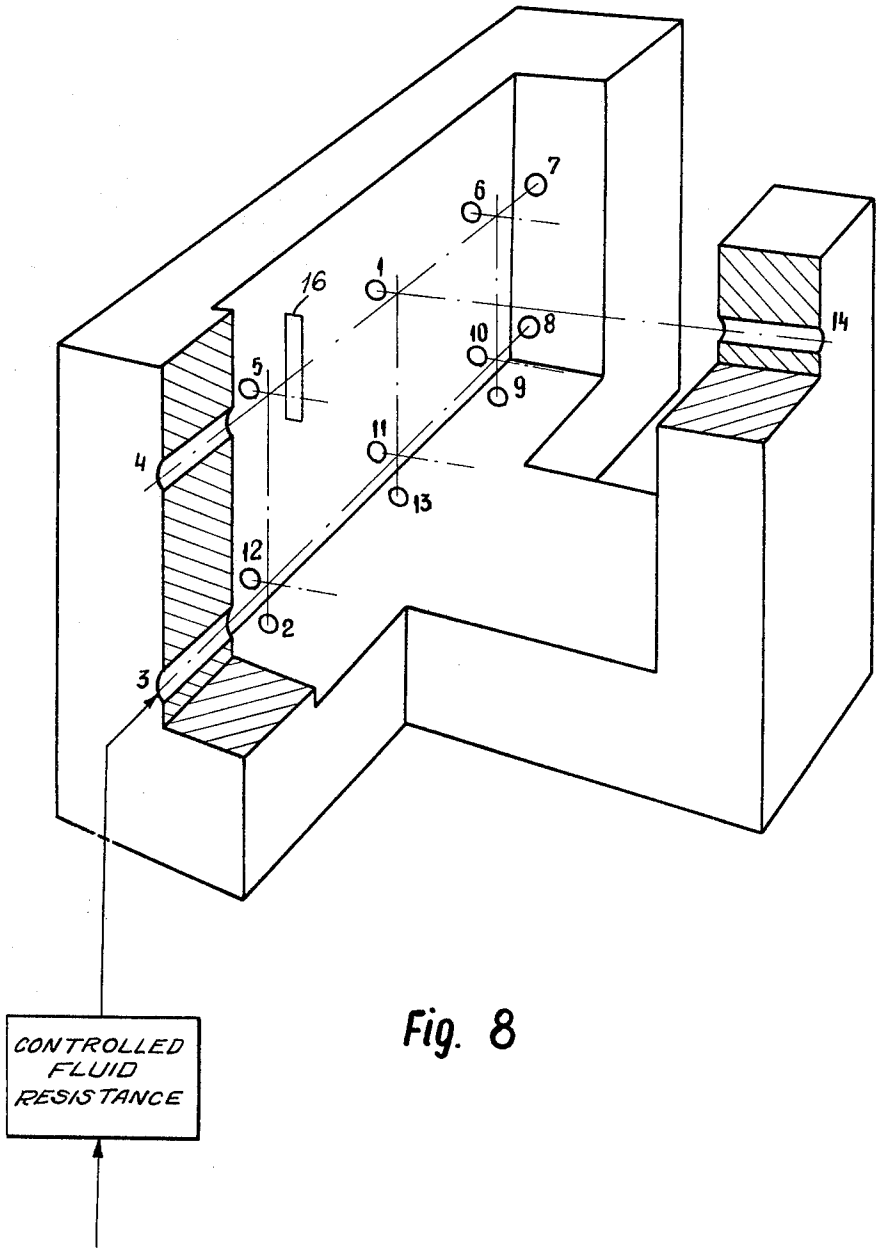

Fig. 8

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MULTIFUNCTION LOGICAL JET ELEMENT

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Int. Cl. F15c 1/14
U.S. Cl. 137—81.5 1 Claim

ABSTRACT OF THE DISCLOSURE

A jet logical element in which the jets controlling a main jet are positioned to interact with each other.

The present invention relates to multi-function jet logical elements by means of which numerous complex logical functions can be realized.

Hitherto known jet logical elements with free jets employed open chambers in the walls of which there were ports for letting through the jets of fluid, i.e., of gas or of liquid. The ports were situated relative to one another in such a manner that the element could be passed through by one main fluid jet directed through one inlet port to the opposite port from which the outlet signal was received. If the flow of the main jet remained undisturbed, pressure appeared at the outlet. The remaining ports of such an element were used for the introduction of fluid jets disturbing directly the flow of the main jet. Such a disturbance gave rise to a pressure fall in the outlet port of the element.

The above described jet logical elements revealed the inconvenience that by means of one element it was possible to realize only some logical functions and this in a small number.

The said inconvenience does not appear in the multi-jet logical element according to the present invention which employs an open chamber provided at least with three inlet ports and at least with one outlet port the axis of which is an extension of the axis of one of said inlet ports. The element according to the invention is distinguished by having the inlet ports situated in relation to one another in such a manner that the fluid jets flowing out of said ports form at least a one-cascade system, i.e., one in which the jet flowing out of one of the inlet ports can be disturbed by another jet flowing out of another inlet port and in which the last mentioned jet can be disturbed by still another fluid jet flowing out of a third inlet port.

It is obvious that if the element according to the invention contains more than three inlet ports, they may be directed toward one another in such a manner that the jets of fluid flowing out of these ports can form a multi-cascade system.

In the drawing:

FIG. 1 illustrates in a plane a system of jets occurring in known logical elements having no cascade jet system;

FIGS. 2 to 7 show, also in a plane, a number of possible cascade jet systems provided in accordance with the invention; and

FIG. 8 is a perspective, partially section view, of a logical element constructed in accordance with the invention.

In FIGS. 1–7, the corresponding inlet jets are indicated by the numbers **1** to **7**, while number **14** refers to the outlet.

The simplest one-cascade jet system is shown in FIG. 2. In this system the flow of the inlet jet **1** to the outlet **14** can be disturbed by the action of inlet jet **2** which in turn can be disturbed by the inlet jet **3**.

FIGS. 3 and 4 show further examples of one-cascade jet systems.

The jets **1, 2, 3** (FIG. 3) act just as the jets **1, 2, 3** in the simplest one-cascade jet system (FIG. 2). The additional inlet jet **4** (FIG. 3) increases the number of inlet signals. Likewise the jets **4, 5, 6** and **7** (FIG. 4) increase the number of inlet signals, without changing the mono-cascade function of the jets produced by the jets **1, 2** and **3** (FIG. 4) acting just as the jets **1, 2** and **3** (FIG. 2).

The simplest two-cascade jet system is shown in FIG. 5. In this system, the run of the inflow jet **1** to the outlet **14** can be disturbed by the action of the inflow jet **2** which in turn can be disturbed by the action of the inflow jet **3** and the latter can be disturbed by the action of the inflow jet **4**.

An example of a more developed two-cascade jet system is shown in FIG. 6. The additional jets **5, 6,** and **7** increase the number of inlet signals. Jets **1, 2, 3** and **4** act just as jets **1, 2, 3** and **4** in the simplest two-cascade jet system (FIG. 5).

A simplest three-cascade jet system is shown in FIG. 7. In this system the run of the inflow jet **1** to the outlet **14** can be disturbed by the action of inflow jet **2** which in turn can be disturbed by the action of inflow jet **3**, and the latter can be disturbed by the action of inflow jet **4**. Inflow jet **4** can be disturbed by the action of inflow jet **5**.

The number of inlets in the three-cascade system can be likewise increased as in the one- and two-cascade systems. It is obvious that there exists an infinite number of possible multi-cascade systems.

The construction of a logical element according to the invention is shown by way of example, in section, in FIG. 8, in which the successive reference numerals from **1** to **13** indicate the inflow ports, while number **14** refers to the sole outlet port of the element.

The ports **1** and **14** are disposed in the logical element in such a manner that the jet flowing out of the port **1** to the port **14** from which the pressure is to be received, may meet on its way with three jets proceeding from the ports **13, 4** and **7**.

Port **7** is located so that the jet proceeding therefrom can be disturbed either by the jet proceeding from port **6** or by the jet proceeding from port **9**.

Port **4** is located so that its jet can be disturbed either by the jet proceeding from port **2** or by that proceeding from port **5**.

Port **13** is located in the element so that its jet can be disturbed either by the jets proceeding from ports **3** and **8** or by the jet proceeding from port **11**.

The location of ports **2** and **12** is made so that their jets can disturb the jet proceeding from port **3** or they can be disturbed themselves by the jets proceeding from ports **8** and **3**.

Ports **9** and **10** are located in such a manner that their jets can disturb the jet proceeding from port **8** or they can be disturbed themselves by the jet proceeding either from port **3** or from port **8**.

A great many examples of logical elements according to the invention can be given.

It is of advantage to insert into the chamber of the element according to the invention immovable screens (e.g., screen **16**) to eliminate vortexes arising due to the interaction of numerous jets upon one another in one chamber. The element may also be provided with pneumatic or hydraulic resistances (e.g., resistance **15**) inserted in series before the inlet ports to obtain the proper pressure difference of the flowing fluid.

The advantage of the present invention consists in that the logical element of the invention admits using in various ways the individual inlet ports by connecting them

to a constant pressure source or by connecting them to an entry signal with the two pressure states, or finally leaving a given port unutilized which fact admits the realization of many logical functions by means of one and the same logical element.

I claim:

1. A multifunction jet logical element comprising a body provided with one open chamber and at least three inlet ports and at least one outlet port the axis of which constitutes an extension of the axis of one of the inlet ports opening into the said chamber, said ports being directed in relation to one another in such a manner that the fluid jets flowing through said ports form with one another at least a one-cascade system in which a jet flowing out of one of the inlet ports is intersected by another jet flowing out of another inlet port, the latter jet being intersected by a fluid jet flowing out of a third of said inlet ports, each jet intersecting with another jet having a free path of flow to the latter said jet, and immovable screens mounted in the chamber for eliminating vortexes of said jets.

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