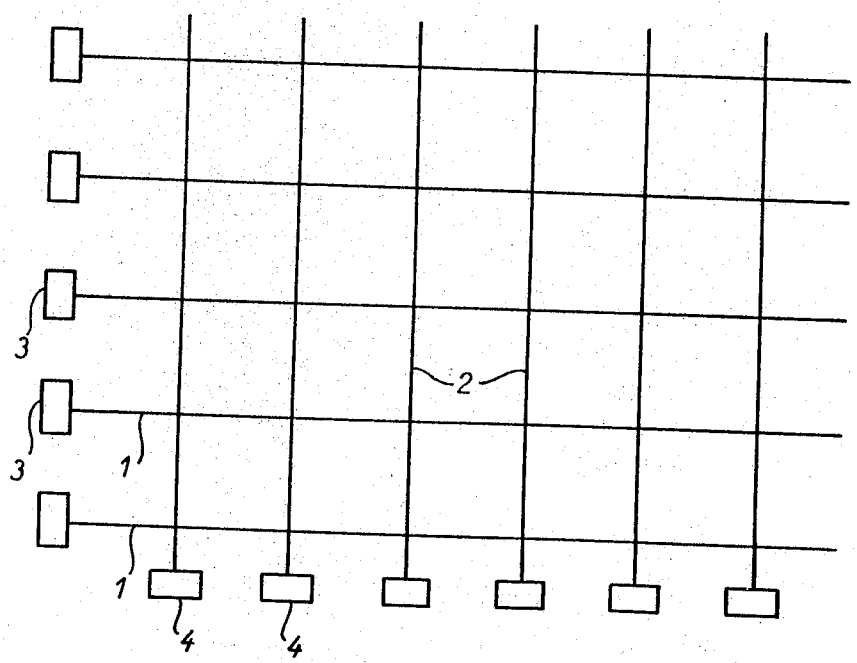
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FLUID MULTISELECTOR

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Fig. 1



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Fig. 2

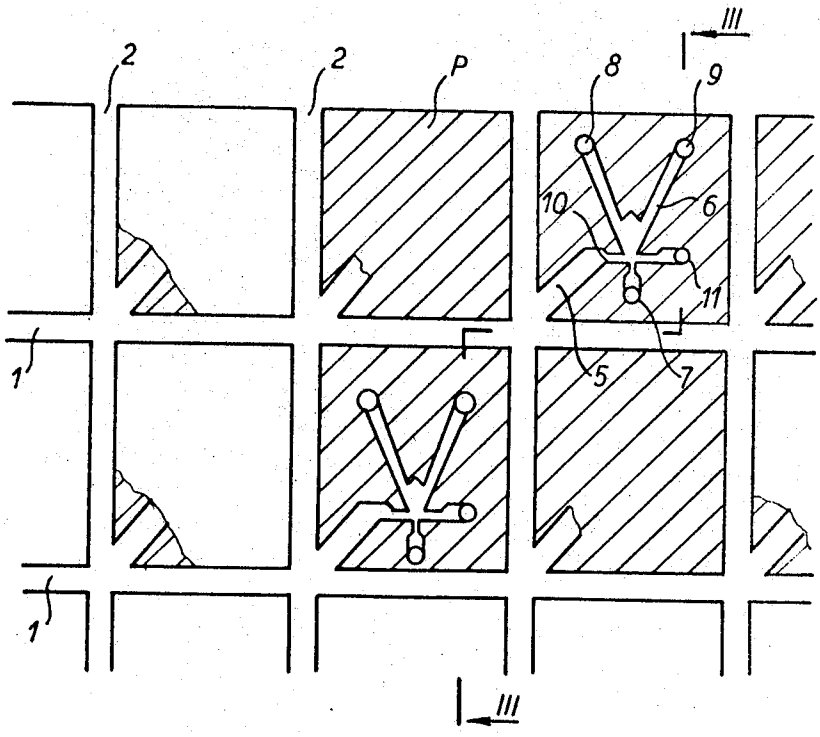


Fig. 3

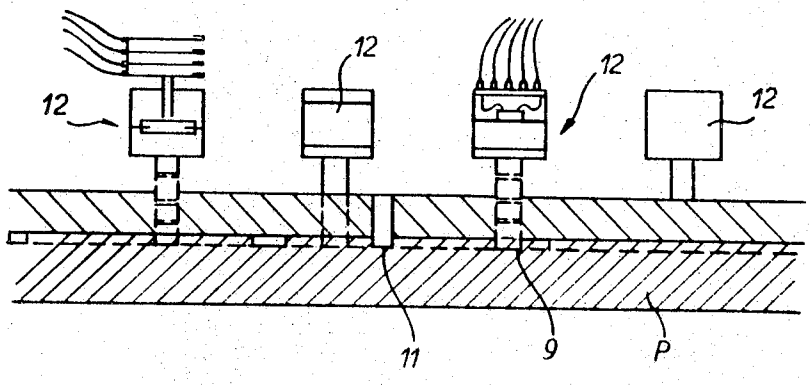
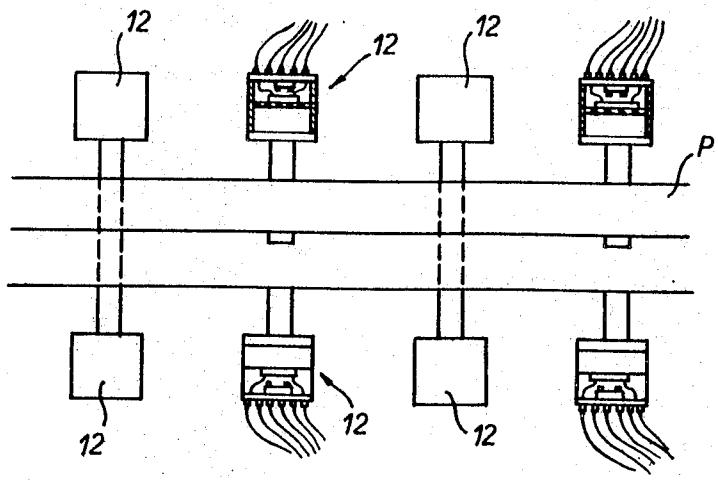


Fig. 4

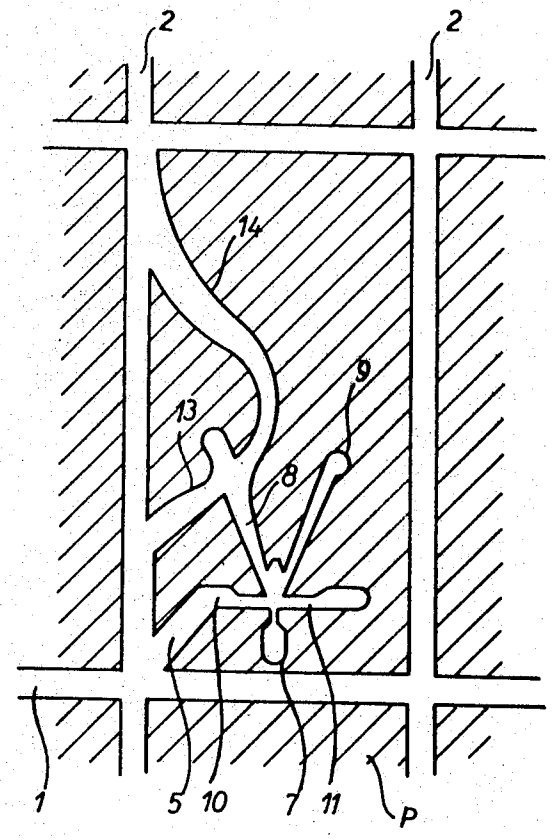


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Fig. 5



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FLUID MULTISELECTOR

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Int. Cl. G06d *1/00;* G06m *1/12*
U.S. Cl. 235—201 13 Claims

ABSTRACT OF THE DISCLOSURE

A fluid memory system including a body formed with a plurality of spaced horizontal column passages and a plurality of spaced line passages intersecting the column passages and establishing fluid communication therebetween, there being provided at each intersection a branch passage angularly positioned to receive the resulting fluid pressure signal from the interaction of a fluid pressure signal in the line passage and a fluid pressure signal in the column passage at the associated intersection, the fluid pressure signal in the branch passage being connected to actuate a bistable fluidic device.

The invention relates to multiselectors of the cross-bar type.

As is well known such selectors comprise a plurality of lines and a plurality of columns both the lines and columns being arranged in rasters, and the raster being arranged to intersect so as to form a grid. In known multiselectors emission of pulse along one line and one column energizes a relay at the intersection, the mechanical energy of which remains stored until the intervention of an external cancelling pulse, which pulse is adapted to re-establish the initial conditions.

An object of the present invention is to provide a cross-bar multiselector having a number of mechanical moving parts which is considerably reduced with respect to known multiselectors. It is thus a further object to provide a multiselector of increased constructional simplicity, quicker response and improved reliability in operation.

A further object is to provide a cross-bar fluid multiselector comprising a network formed from the intersection of a raster of conduit lines and a raster of conduit columns through which conduits fluid streams may flow, a branch conduit being provided at an intersection and being so angled to the line and column constituting the said intersection as to collect the stream thereat resulting from the convergence of a simultaneous line stream and column stream, the said branch conduit leading to the input of a bistable amplifier having storage capabilities and the fluid flowing thereto from the branch conduit acting as a control fluid therefor so as to switch the flow therethorugh of a power stream from an inoperative to an operative condition, the latter condition causing the operation of an electrical switch.

In use of a multiselector according to the invention, the fluid streams are fed along the conduits representing the lines and columns preferably in the form of pulses through conventional electropneumatic transducers known in the art.

The invention may be usefully employed in all technical fields in which cross-bar multiselectors are used, such as in the field of computers, telecommunications, and more particulary in telephony, machine tool programming and industrial processes generally.

These and other objects and advantages of the invention will be clear from the following description, given with reference to the accompanying drawing, which are by way of example and in which:

FIG. 1 is a diagrammatical representation of the basic layout of a cross-bar multiselector;

FIG. 2 is a part sectioned representation of a multiselector according to the present invention;

FIG. 3 is a sectional view taken along line III—III of FIG. 2;

FIG. 4 is a diagrammatical and partly sectioned elevational view of a multiselector according to a modification of FIG. 3; and

FIG. 5 is a sectional view similar to that of FIG. 2 of a modified embodiment.

In FIG. 1 the diagram of the basic fluid multiselector layout shows a grid comprising a plurality of conduits **1** forming lines and at right angles thereto a plurality of conduits **2** forming columns. Means **3** and **4** are provided for selectively introducing a signal comprising a fluid stream pulse respectively into a line **1** and column **2**.

At each intersection of a line and a column a branch conduit **5** is provided (FIG. 2), the axis of which branch is situated in the plane defined by the axes of the conduits **1** and **2** from which it is branched. The branch conduits **5** thus receive the resultant streams of the two fluid streams simultaneously converging through the conduits **1** and **2**. When the two converging currents from the conduits **1** and **2** are equal in velocity and the conduits **1** and **2** of equal size, the branch conduit **5** lies along the bisector of the angle defined by the forces in the said conduits.

The conduits **1** and **2**, as well as the conduit **5**, are bored in a plate P which is preferably of plastic or ceramic material.

Each branch conduit **5** leads to the inlet of a bistable fluid amplifier **6** which is also bored, in the embodiment shown in FIGS. 2 and 3, in the same said plate which is carrying the columns and lines. The amplifier could however, alternatively be provided in a separate plate combining all the amplifiers of the multiselector.

In accordance with known techniques, the amplifiers (FIG. 2) each comprise an input conduit **7** for the power fluid and two output conduits **8, 9** for the working fluid branched from the input conduit. Two conduits **10, 11** are branched from the intersection of the conduits **7, 8** and **9**, extending generally transversely of the above-mentioned conduits **7, 8** and **9**, and substantially in alignment with one another. It is through the conduits **10** and **11** that the control fluid for the intersection of the conduits is conveyed. Each conduit **10** is connected with a branch conduit **5**, and each conduit **11** is connected with means, not shown, adapted to supply a fluid jet for cancellation purposes.

The power fluid supplied by the conduit **7** flows, unless external actions intervene, through the conduit **8** by a wall effect which is well known in the fluid amplification art, and passes ineffectually to the outside. This condition shall be referred to hereafter in the specification and claims as the inoperative condition.

When the fluid stream collected by the conduit **5** reaches, through conduit **10**, the interaction region of the conduits **7, 8** and **9**, the power jet from conduit **7** is switched over from conduit **8** to conduit **9**.

The conduit **9** is connected with a pneumo-electric transducer **12** (FIG. 3) of a type known per se, such as of the membrane or piston type. The transducer **12** is adapted to utilize the energy of the power jet for operating a plurality of electric switch contacts.

As the control stream in the conduit **10** ceases, the power jet remains switched over to the conduit **9** by the storage effect inherent in the amplifier. That is to say,

stable equilibrium is possible in either the operative or the inoperative condition of the power jet 7.

The amplifier at the intersection of the line 1 and column 2 which has effected switching over of the amplifier remains in an engaged condition until a cancellation pulse of external origin is sent to the amplifier through the conduit 11. This switches back the jet from conduit 9 to conduit 8, thereby re-establishing the inoperative condition in the amplifier 6 and the initial conditions of the transducer 12.

In FIG. 3 there is shown a fluid multiselector for operating a plurality of transducers 12 which are all arranged on one and the same side of the plate P carrying the conduits 1, 2 and 5.

However, in the modified embodiment shown in FIG. 4 the fluid multiselector is connected with two sets of pneumo-electric transducers 12 arranged on two opposite sides of the plate P. This arrangement doubles the capacity of the intersection or crossing points of the multiselector, but with their overall size remaining, the same; in the case shown in FIG. 4 each branch conduit 5 feeds the control unit 10 of two distinct fluid bistable amplifiers 6 which are connected in parallel with each other on the same said conduit 5. In practice the two sets of branched amplifiers 6 are preferably formed on two opposite faces of one and the same plate which is superposed on the plate P provided with the channels 1, 2 and 5. The two sets of amplifiers 6 are separately fed by the power fluid by means of a selective control when one or, alternatively, the other set of amplifiers 6 is to be activated. In every case the pulses converging from the channels 1 and 2 to their respective intersections simultaneously operate the two sets of switches, of which only those fed with power fluid are activated.

Return to the inoperative condition of the power jets in the amplifiers 6 can be effected not only by the control jet through conduit 11, but also by cutting off the supply of power fluid to the conduit 7 at the desired moment. In this case the construction of the multiselector is simplified.

The modified embodiment shown in FIG. 5 permits utilization of the power stream of the amplifier 6 for making up pressure losses in the pulsating fluid streams in the conduits 1 and 2; these losses are particularly sustained when the conduits 1 and 2 are of considerable length and there are thus a considerable number of intersections.

According to this modified embodiment two conduits 13, 14 are branched from the conduit 8 of each amplifier, the conduit 13 opening into the column 2 associated with the intersection of the amplifier 6 and extending substantially parallel to the branch conduit 5. The conduit 14 opens into the same column 2, but on the downstream side of the conduit 13. This arrangement provides, at the intersection of the conduits 8, 13 and 14, an interaction region of the fluid streams so that, in the absence of fluid in the conduit 13, the power fluid in the conduit 8 is discharged to the outside along the ordinary path.

However, on intervention of a fluid stream in the conduit 13 the power stream in the conduit 8 is deflected to the conduit 14 and reaches the column 2, thereby reinforcing the signal thereat.

By the use of the above-described construction several amplifiers may be simultaneously energized at various intersections by the same pressure pulse, whatever their arrangement in the raster.

As will be evident, although in the embodiment shown in FIG. 5 it is the pressure loss in a column 2 that is compensated for, the same device could equally well be employed for making up the pressure loss in line 1.

What we claim is:

1. A cross-bar fluid multiselector comprising: body means, a plurality of substantially parallel line fluid conduits and a plurality of substantially parallel column fluid conduits in said body means, both of said line and column conduits being continuous, said line conduits being substantially perpendicular to and intersecting said column conduits to form a network, a plurality of branch conduits in said body means, at least one bistable fluid amplifier, with storage capabilities, a supply for power fluid to each said bistable amplifier, and an electrical switch associated with each said bistable amplifier, there being provided one of said branch conduits at each intersection between a line conduit and a column conduit opening at the juncture of said intersections and so angled thereto as to collect the stream thereat resultant from the convergence of simultaneous streams of fluid in a line conduit and in a column conduit by being substantially aligned with the resulting flow vector from the application of said simultaneous streams interacting at the associated intersection, said branch conduits each controlling one of said bistable amplifiers and the fluid flowing thereto from the said branch conduits acting as a control fluid therefor so as to switch the flow through said amplifier or the said power fluid from an inoperative to an operative condition, the latter said condition causing the operation of the said electrical switch, and means for supplying control fluid to said line fluid conduits and said column fluid conduits.

2. A multiselector according to claim 1 wherein the said amplifier is provided with cancelling means, the same cancelling means comprising a conduit arranged to feed an externally produced stream pulse to said amplifier.

3. A multiselector according to claim 1 wherein a plurality of amplifiers and switches are provided, one of each at a plurality of said intersections.

4. A multiselector according to claim 1 wherein a plurality of amplifiers are provided, one branch conduit and one of said amplifiers being arranged at each of said intersections.

5. A multiselector according to claim 4 wherein means are provided for selectively supplying the said power stream to one of the plurality of said amplifiers associated with the single said branch conduit.

6. A multiselector according to claim 1 wherein a first further conduit and a second further conduit are provided in associated with at least one of said amplifiers, an output conduit in said one amplifier, the said further conduits being branched from said output conduit of the said amplifier, the first said further conduit being substantially parallel to the said branch conduit associated with the said amplifier, and the second said further conduit being connected to the associated line or column conduit at a point further downstream than a point at which the first further conduit is connected thereto.

7. A multiselector according to claim 1 wherein electropneumatic transducers are provided for feeding fluid pulses to the said conduit lines and columns.

8. A multiselector according to claim 1 wherein the said line conduits and column conduits intersect at right angles, and the network is a grid.

9. A multiselector according to claim 1 wherein the said line conduits and column conduits are enclosed in a plate of suitable synthetic material selected from the group containing plastics and ceramics.

10. A multiselector according to claim 1 wherein at least one said amplifier is enclosed in a plate of suitable synthetic material selected from the group including plastics and ceramics.

11. A fluid memory matrix, comprising: body means, a plurality of spaced substantially parallel line passages in said body means, a plurality of spaced substantially parallel column passages in said body means, said line passages being coplanar with and intersecting said column passages at substantially ninety degrees, a branch passage in the body means at the intersections, said branch passages opening at the junctions of said intersections and being angularly related with respect to the line and column passages so as to be substantially aligned with the resulting flow vector from the application of simultaneous

fluid signals at the associated intersections, and fluid valve means communicating with said branch passages and controlled thereby, and means for supplying control fluid to said line passages and said column passages.

12. A fluid memory matrix, comprising: body means, a plurality of spaced line passages in said body means, a plurality of spaced column passages in said body means generally perpendicular to said line passages, said line and column passages defining a grid network, a plurality of fluid amplifiers associated with the grid network and responsive to the application of fluid signals in selective line and column passages to provide a first output signal, at least one of said amplifiers also having means for amplifying a fluid signal in one of said passages and passing the amplified signal on in the said one passage.

13. A fluid memory matrix as defined in claim **12**, wherein said one amplifier is a fluidic amplifier having bistable characteristics and including a first outlet passage and a second outlet passage, said first outlet passage carrying said first output signal, a branch passage communicating with said one passage for receiving the fluid pressure signal to be amplified and conveying the signal to said second outlet passage, a second branch communicating with said second outlet passage and with said one passage, said second passage positioned to receive the resultant fluid pressure signal of the interaction of the fluid pressure signal in said branch passage and the fluid flow in the second outlet passage whereby an amplified fluid pressure signal is delivered to said one passage.

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U.S. Cl. X.R.

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