

[54] **FLUID MANIFOLDING ARRANGEMENT**

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[51] Int. Cl. F16d 1/00

[58] Field of Search 137/271, 608, 81.5;
251/367; 138/111, 115, 116, 117

[56] **References Cited**
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[57] **ABSTRACT**

A group of fluid input connectors and a group of fluid output connectors are coupled together to provide a matrix of paired, aligned ports, one port of each pair communicating with one of the input connectors and the other port of the pair communicating with one of the output connectors. Programming means couples together the individual respective ports of preselected pairs, and isolates from each other the individual respective ports of the remaining pairs.

3 Claims, 9 Drawing Figures

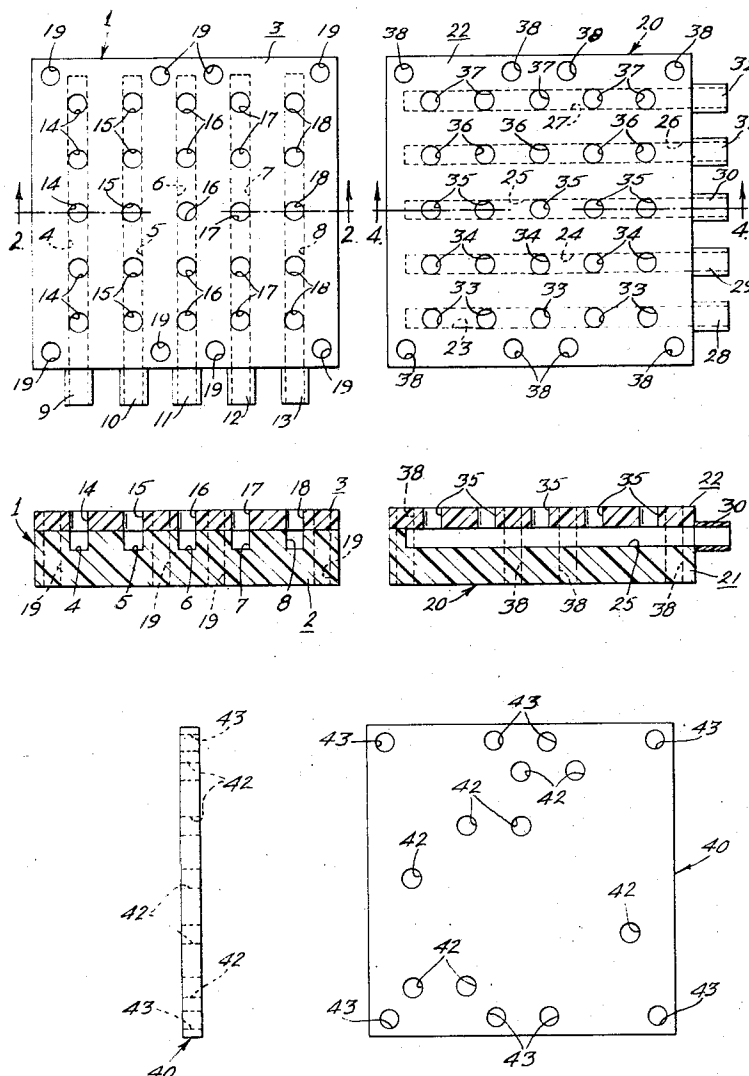


FIG. 1

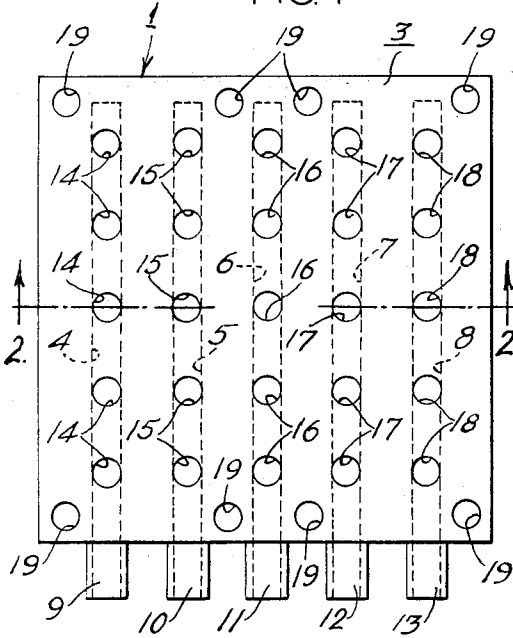


FIG. 3.

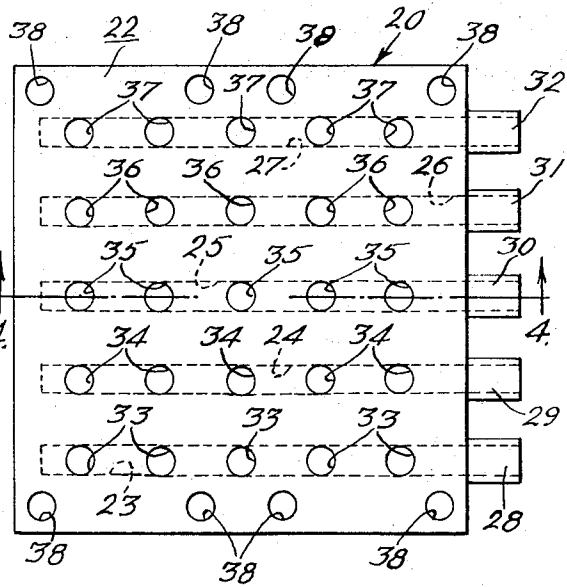


FIG. 2

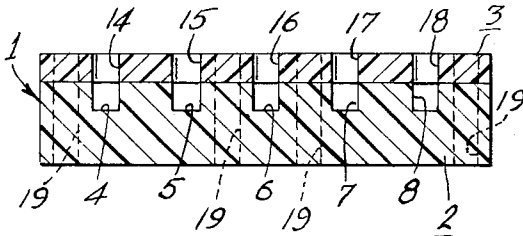


FIG. 4.

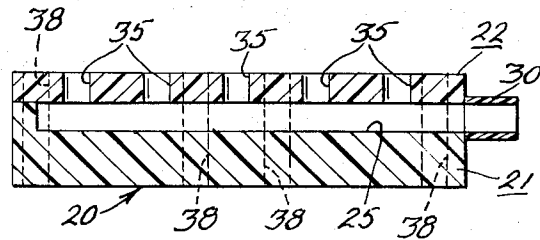


FIG. 5.

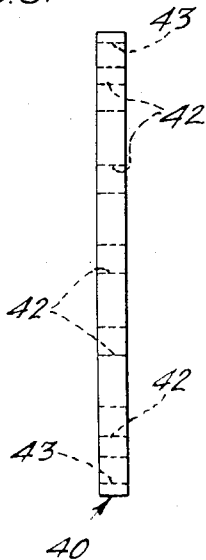
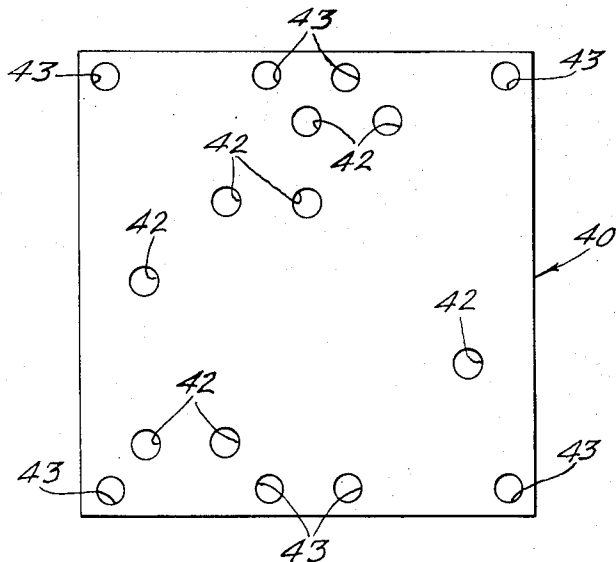
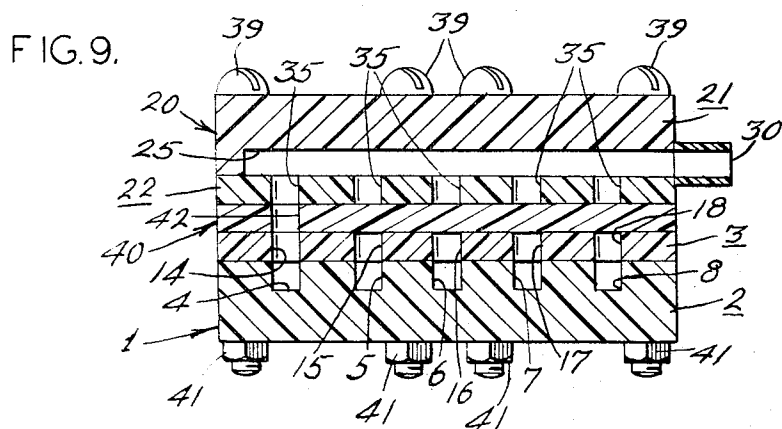
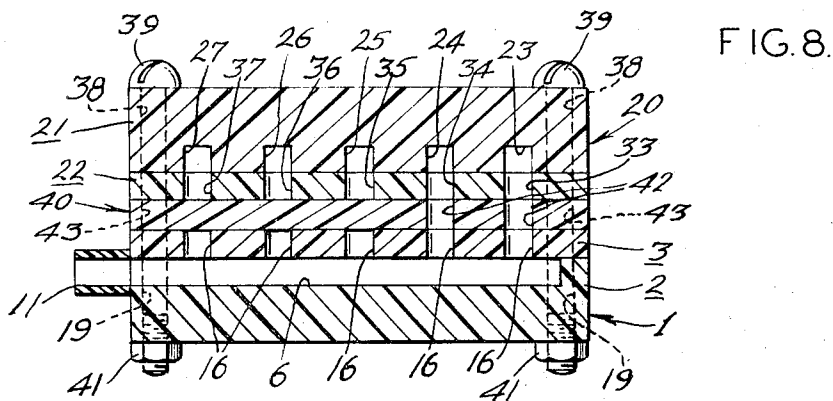
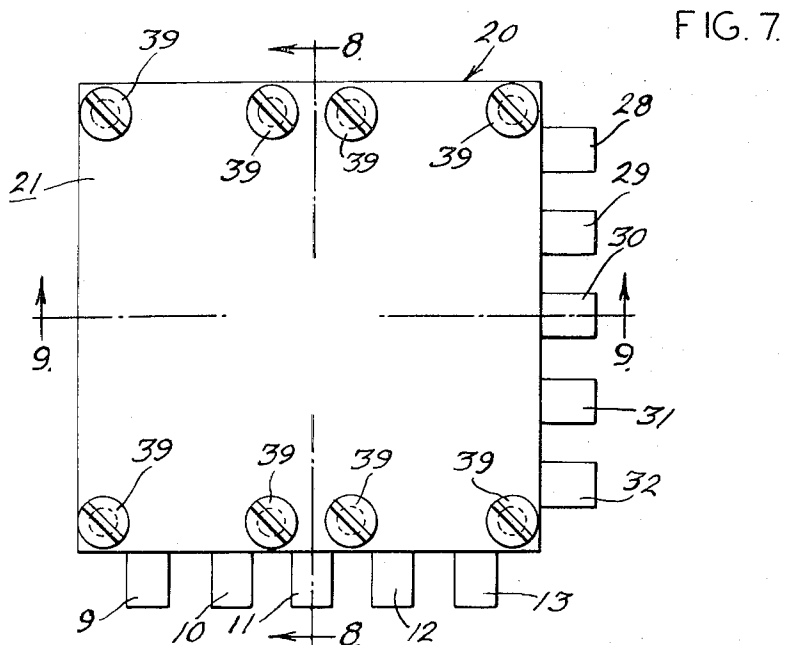


FIG. 6.





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FLUID MANIFOLDING ARRANGEMENT

This invention relates to a device useful in fluidic (fluid logic) and/or hydraulic circuits, and more particularly to a device (a fluid manifold arrangement) for enabling fluid input signals to be branched to any number of specified (output) passages.

An object of this invention is to provide a novel fluid manifold arrangement.

Another object is to provide a novel form of device for branching fluid input signals to any number of output passages.

A further object is to provide a device by means of which changes in the manner of fluid signal branching (to output passages) may be accomplished in a relatively simple yet effective manner.

The objects of this invention are accomplished, briefly, in the following manner: An input manifold, comprising M input connectors with each of which N discrete ports communicate, is assembled in stacked relationship with an output manifold comprising N output connectors, with each of which M discrete ports communicate, to provide a matrix of MN paired, aligned ports (M may or may not be equal to N). One port of each such pair is an input port and the other port of the pair is an output port. A program gasket, sandwiched between the input and output manifolds, is provided with holes in selected locations for coupling together the respective input and output ports of preselected pairs, the absence of holes causing the input and output ports of other pairs to be isolated from each other. Fluid circuit changes (i.e., changes in the pairs of ports selected for coupling, and those selected for isolation) can be accomplished by simply changing the program gasket.

A detailed description of the invention follows, taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is a face view of an input manifold subassembly utilized in this invention;

FIG. 2 is a cross-section taken along line 2—2 of FIG. 1;

FIG. 3 is a face view of an output manifold subassembly;

FIG. 4 is a cross-section taken along line 4—4 of FIG. 3;

FIG. 5 is a side view of a program gasket;

FIG. 6 is a face view of a typical program gasket;

FIG. 7 is a plan or top view of a complete fluid manifold assembly;

FIG. 8 is a cross-section taken along line 8—8 of FIG. 7; and

FIG. 9 is a cross-section taken along line 9—9 of FIG. 7.

Refer first to FIGS. 1 and 2. An input manifold subassembly, denoted generally by numeral 1, comprises a block member 2 on whose upper surface is disposed (when in assembled position, as illustrated) an apertured plate 3. Both the block 2 and the plate 3 are of square (or, in some cases, rectangular) configuration, seen in face view as in FIG. 1. Block 2 has formed in its upper surface M (where M is an integer greater than one, and is illustrated as of value five) spaced, parallel, straight channels 4, 5, 6, 7, and 8 which are closed at one end. To the outer, open ends of the channels 4, 5, 6, 7, and 8 are fitted (at one side of the block 2) the fluid input connectors 9, 10, 11, 12, and 13, respectively.

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The apertured plate 3 has therein a plurality of holes (which serve as ports) arranged in columns which are aligned with the respective channels 4—8. Thus, each of the channels 4—8 has N (where N is an integer greater than one, and typically may have a value of five) equally spaced discrete ports (the ports being in plate 3, which overlies the upper, open sides of the channels) communicating therewith. In plate 3, the N ports 14 communicate with channel 4 and connector 9; the N ports 15 communicate with channel 5 and connector 10; the N ports 16 communicate with channel 6 and connector 11; the N ports 17 communicate with channel 7 and connector 12; the N ports 18 communicate with channel 8 and connector 13. A plurality of aligned clearance holes 19 for tie bolts are provided in block 2 and plate 3.

Refer now to FIGS. 3 and 4. An output manifold subassembly, denoted generally by numeral 20, is adapted to be assembled with the input subassembly 1 in stacked relationship, as will later be described. The output subassembly comprises a block member 21 and an apertured plate 22. Both the block 21 and the plate 22 (which are in face-to-face position, as illustrated, when assembled) are of square configuration (when M is equal to N) or of rectangular configuration (when M is not equal to N), seen in face view as in FIG. 3, and have the same size as block 2 and plate 3. Block 21 has formed in the surface thereof which is adjacent to plate 22 N spaced, parallel, straight channels 23, 24, 25, 26, and 27 which have the same cross-section as channels 4—8 and which are also closed at one end. To the outer, open ends of the channels 23, 24, 25, 26, and 27 are fitted (at one side of the block 21) the fluid output connectors 28, 29, 30, 31, and 32, respectively.

The apertured plate 22 has therein a plurality of holes (which serve as ports) arranged in rows which are aligned with the respective channels 23—27. Thus, each of the channels 23—27 has M (where M is the same as for subassembly 1) equally spaced discrete ports (the ports being in plate 22, which is in juxtaposition with the open sides of the channels) communicating therewith. In plate 22, the M ports 33 communicate with channel 23 and connector 28; the M ports 34 communicate with channel 24 and connector 29; the M ports 35 communicate with channel 25 and connector 30; the M ports 36 communicate with channel 26 and connector 31; the M ports 37 communicate with channel 27 and connector 32. A plurality of aligned clearance holes 38 for tie bolts are provided in block 21 and plate 22.

Before describing a program gasket which is actually sandwiched between the input manifold subassembly and the output manifold subassembly in the complete fluid manifold arrangement or assembly, the stacking together of the two subassemblies themselves will first be described. To stack together the two subassemblies, the output manifold subassembly 20 would first be rotated 180° about an axis established as a horizontal center line in FIG. 3 (actually, this axis would be along section line 4—4), and then placed on top of the subassembly 1 in FIG. 1. Then, after inserting the tie bolts 39 through the holes 38 of subassembly 20 and the aligned holes 19 of subassembly 1, the composite device or assembly would appear as in FIG. 7. The bolts 39 have heads on one end (which engage the outer surface of block 21) and nuts 41 which thread onto the opposite ends of the bolts and engage the outer surface of

block 2. This arrangement serves to hold the assembly together, with the two subassemblies in stacked relationship.

It will be observed that the two manifold subassemblies 1 and 20 are positioned, in the assembly, so that the channels 4-8 are perpendicular to the channels 23-27, and so that all of the crossing points of the two channels are located at the positions of the respective ports 14-18, on the one hand, and 33-37, on the other hand. Thus, there is formed a matrix of MN paired, aligned ports, with one port of each pair being an input port (communicating with one of the input connectors 9-13) and the other port of the pair being an output port (communicating with one of the output connectors 28-32). This forms, in effect, a matrix of connecting ports between the input manifold 1 and the output manifold 20. The paired, aligned relation of the ports (in the two respective apertured plates 3 and 22) is clearly illustrated in FIGS. 8 and 9. By way of example, in the left-hand column of the composite assembly, single output ports of the successive groups 33, 34, 35, 36, and 37 are aligned respectively with successive single input ports of the group 14; in the upper row of the composite assembly, single input ports of the successive groups 14, 15, 16, 17, and 18 are aligned respectively with successive single output ports of the group 33.

Refer now to FIGS. 5 and 6, as well as FIGS. 8 and 9. The pairs of aligned ports can be selectively coupled together, or isolated from each other (thus selectively opening or closing couplings between the input connectors 9-13, on the one hand, and output connectors 28-32, on the other hand), by means of a program gasket 40 which is sandwiched between the two manifold subassemblies 1 and 20. The gasket 40, as illustrated in FIG. 6, has one or more (a total of eight are shown) holes 42 distributed thereon in a selected pattern, the holes being located in alignment with selected ones of the paired, aligned ports previously mentioned. The presence of a hole at any selected matrix location on gasket 40 serves to couple together the individual ports (in the input and output manifold subassemblies, respectively) at that same location, while the absence of a hole at a matrix location serves to isolate from each other the individual ports at that same location. As illustrated in FIG. 8, one of the holes 42 in gasket 40 couples input channel 6 (and input connector 11) to output channel 23 (and output connector 28) by way of holes 16 and 33, while another hole 42 couples input channel 6 (and connector 11) to output channel 24 (and connector 29) by way of holes 16 and 34. The other output channels 25, 26, and 27 are isolated from input channel 6 because of the absence of holes in the gasket 40 at the appropriate locations. In FIG. 9, one of the holes 42 in gasket 40 couples input channel 4 (and input connector 9) to output channel 25 (and output connector 30) by way of holes 14 and 35. Output channel 25 is isolated from the other input channels 5, 6, 7, and 8 because of the absence of holes in the gasket 40 at the appropriate locations.

A plurality of clearance holes 43 are provided in gas-

ket 40, for the tie bolts 39.

Any changes in the manner of signal branching (i.e., any changes in the fluid circuit) can be accomplished by simply changing the program gasket 40, in order to change the pattern of holes 42 and thus to change the paired ports selected for coupling and those selected for isolation.

In operation, individual signals can be fed into the input manifold connectors 9-13 (and input manifold channels 4-8), and branched out in the desired manner via the program gasket 40 (by means of gasket holes 42) to the output manifold channels 23-27, and finally to the appropriate receiving elements through the output manifold connectors 28-32.

Additional tie bolts 39 (not shown) could be utilized, located for example between channels 24 and 25, and between channels 25 and 26 (FIG. 3), at both the right-hand and left-hand edges of this FIGURE.

The manifolding arrangement (assembly) of the invention has been indicated (by cross-hatching) as being formed from a synthetic resin type of material. For example, it could be formed from a polycarbonate-type thermoplastic, or an ABS resin. The gasket 40 could be formed from the material known as Mylar. For high-temperature applications, however, the assembly could be formed from a suitable metal, such as stainless steel. Metal would be preferable to thermoplastics in high-temperature environments.

The invention claimed is:

1. A fluid manifolding arrangement including first and second manifolds adapted to be assembled together in stacked relationship; said first manifold comprising a plurality of spaced, parallel, elongated channels each of which has N discrete ports communicating therewith, where N is an integer greater than one; said second manifold comprising a plurality of spaced, parallel, elongated channels each of which has M discrete ports communicating therewith, where M is an integer greater than one; the channels of the respective manifolds when assembled extending at right angles to each other, the respective ports and channels being so arranged as to provide, when said manifolds are assembled, a matrix of MN paired, aligned ports, one port of each pair being in said first manifold and the other port of the pair being in said second manifold; and a masking plate sandwiched between the two manifolds, said plate providing a masking pattern such as to couple together the individual respective ports of only preselected pairs and to isolate from each other the individual respective ports of the remaining pairs.

2. Arrangement according to claim 1, wherein the first manifold contains M channels and the second manifold contains N channels.

3. Arrangement according to claim 1, wherein said plate comprises a program gasket having therein a two-dimensional pattern of discrete holes in preselected locations for coupling together the individual respective ports of the preselected pairs, but being otherwise impermeate.

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