United States Patent [19]

Menz et al.

[11] **3,768,409**

[45] **Oct. 30, 1973**

[54] **BINARY EXPLOSIVE LOGIC NETWORK**

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[73] Assignee: **The United States of America as represented by the Secretary of the Navy**, Washington, D.C.

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[21] Appl. No.: **305,642**

[52] **U.S. Cl.** **102/22**, 102/DIG. 2

[51] **Int. Cl.** **F42b 3/10**

[58] **Field of Search** ..... 102/70.2 R, 22, DIG. 2

[56] **References Cited**

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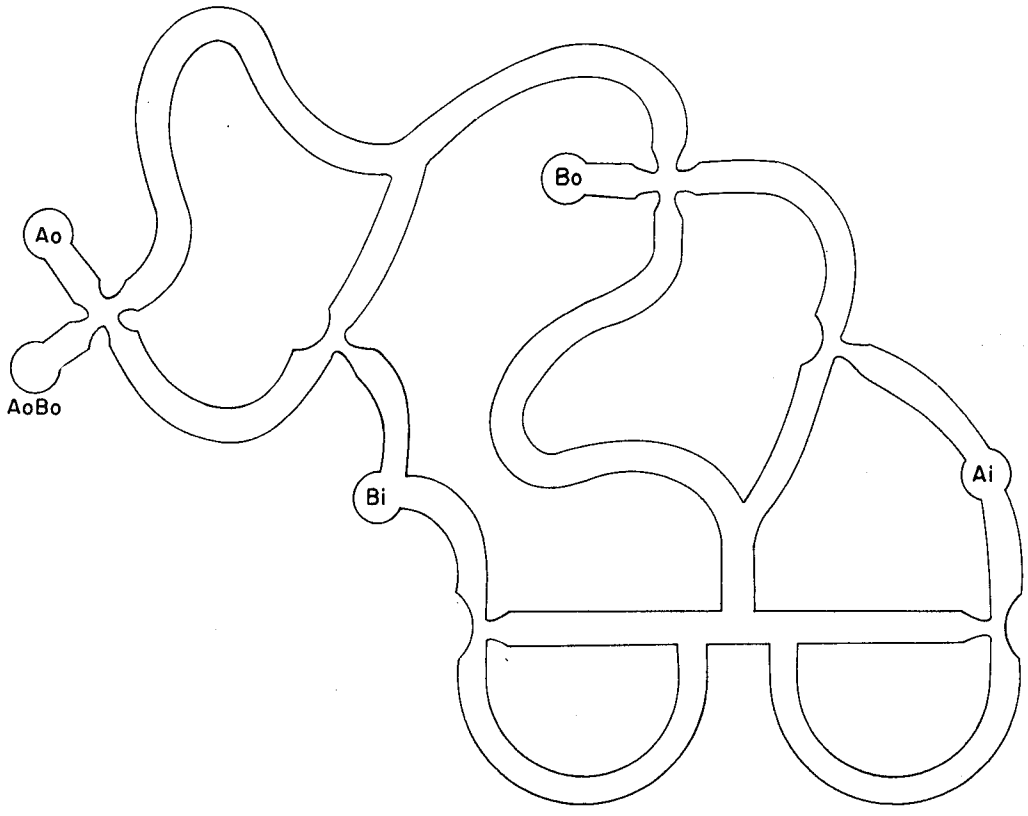
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Assistant Examiner—C. T. Jordan
Attorney—R. S. Sciascia et al.

[57] **ABSTRACT**

An explosive logic network with two inputs wherein initiation of either the first input, the second input or the first and second inputs simultaneously results in a first output, a second output or a third output, respectively.

2 Claims, 4 Drawing Figures



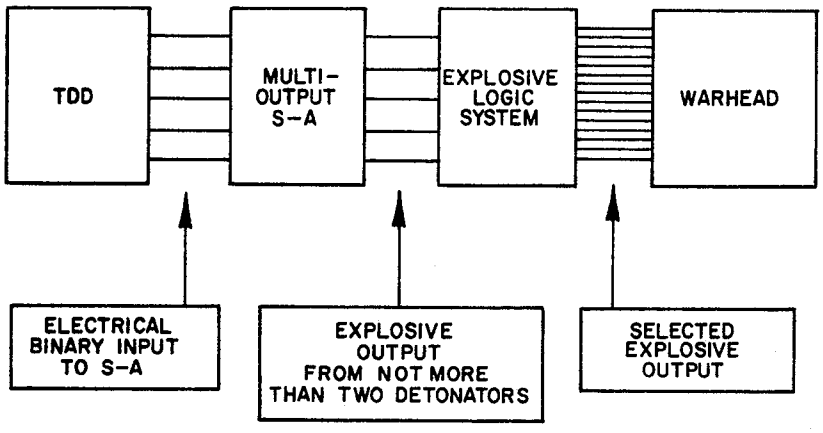

TDD
MULTI-
OUTPUT
S-A
EXPLOSIVE
LOGIC
SYSTEM
WARHEAD
ELECTRICAL
BINARY INPUT
TO S-A
EXPLOSIVE
OUTPUT
FROM NOT MORE
THAN TWO DETONATORS
SELECTED
EXPLOSIVE
OUTPUT

Fig. 1

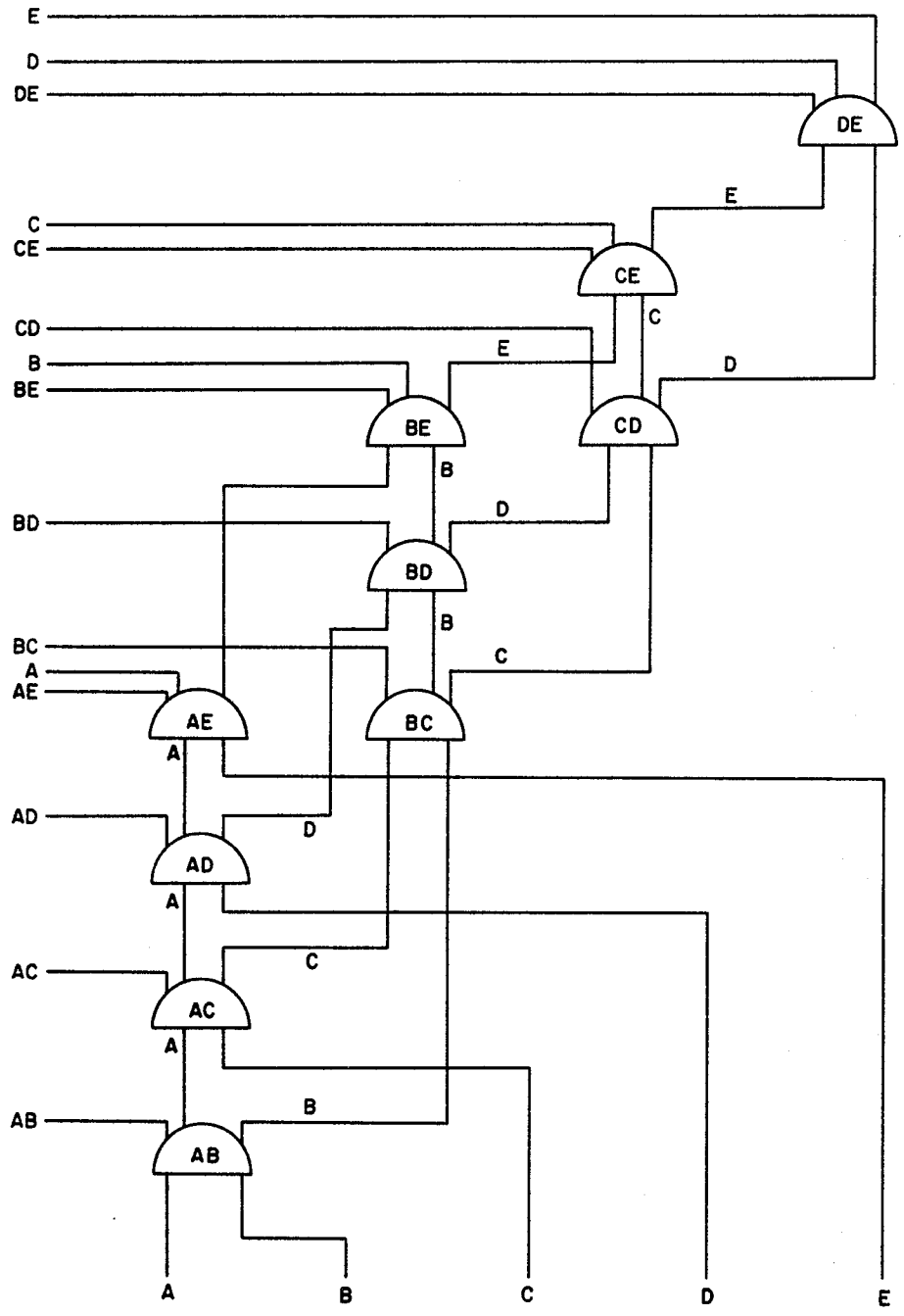

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Fig. 2

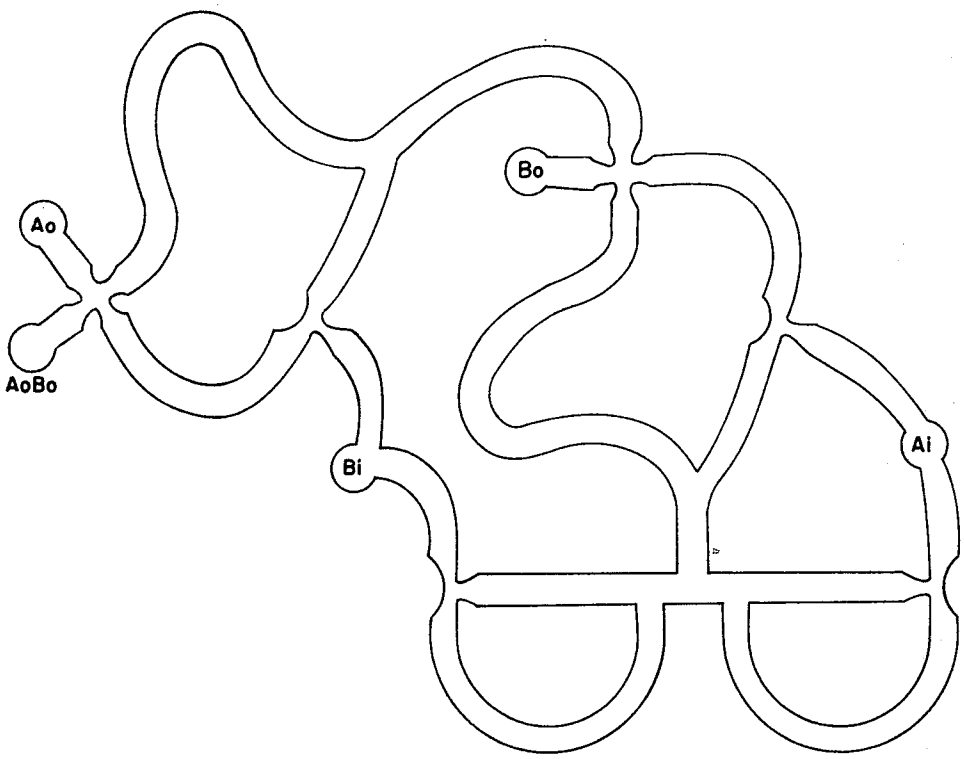


Fig. 3

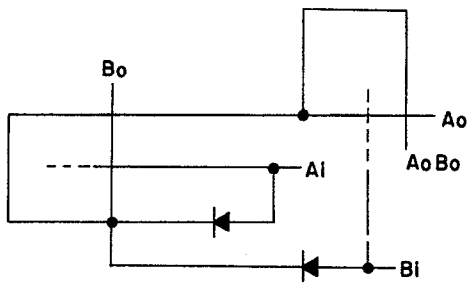


Fig. 4

BINARY EXPLOSIVE LOGIC NETWORK

BACKGROUND OF THE INVENTION

1. This invention pertains to multi-input-multi-output explosive logic circuits.

2. In the past, explosive logic elements such as the one disclosed in the patent to Silvia et al., U.S. Pat. No. 3,430,564, require time delays along the explosive path in order to provide a number of outputs greater than the number of inputs to logic elements. The present invention requires activation of single inputs alone or simultaneous activation of single inputs. By eliminating the need for time delays in the explosive circuits, the present invention has greatly increased the reliability and decreased the complexity of the explosive channel matrix and the design of a given explosive logic circuit.

SUMMARY OF THE INVENTION

The present invention is a two-input-three-output explosive logic element employing Boolean logic. The primary advantage of the present invention is that it does not require the input to be initiated in a particular order in order to obtain a particular output, but rather requires only that the input be initiated individually or that a plurality of inputs be initiated simultaneously. The further advantage of the present invention is that the logic circuits can be pyramided so that a large number of output points becomes available with only a few input points. This is desirable in that each input point requires a detonator, and the fewer detonators the greater the safety of the device.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows schematically how the invention fits into an aimable warhead system;

FIG. 2 shows schematically how the invention may be pyramided;

FIG. 3 shows a physical layout of the invention; and

FIG. 4 is a schematic of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The physical representation of the invention as seen in FIG. 3 shows two inputs, A_i and B_i. Referring to A_i it is seen that explosive paths extend in both directions from A_i with one deadending at an explosive null gate and the other passing through an explosive diode and branching out. One branch passes to the back end of another explosive diode and terminates, while the other two branches extend to a destructive crossover. Since one path has been broken at the explosive null gate the other path extends across the destructive crossover and branches out into two branches of different length. The shorter branch passes through an explosive null gate and beats the other branch to an explosive crossover thereby giving an A_o output.

If input B_i only is initiated, two explosive paths extend from B_i. One path is to an explosive null gate where it is terminated while the other one passes through an explosive diode and then branches out into the back end of another explosive diode where it is terminated. The other branch again branches out with each path converging to a destructive crossover. The paths are of different lengths with the shorter path passing through an explosive null gate and through the destructive crossover to output B_o and cutting off the other path.

If inputs A_i and B_i are detonated simultaneously, it is seen that one path from each of them passes to an explosive null gate and is terminated and also cuts off the path which it intersects. The other path from A_i and B_i both pass through their respective explosive diodes and units into a single path which branches. One branch terminates at an explosive null gate while the other branch passes through a destructive crossover and again branches out with one of the branches terminating at a destructive null gate and the other branch passing on to output A_o, B_o. The network of FIGS. 3 and 4 is shown symbolically in FIG. 2 as a semicircle with inputs coming into the straight side and outputs extending from the curved side. It can be seen in FIG. 2 how ten of the circuits of the present invention may be pyramided or stacked so that a total of five inputs can produce fifteen different outputs if any single input is employed along or with any one of the other inputs. This network would require only five miniaturized detonators, which when in the safe condition would be out of line with the five inputs to the logic network.

A fuze would, after target detection, detonate any one or any combination of two detonators at approximately the same time. The explosive logic circuit would very quickly select the correct line initiation system of the warhead causing the synergistic effects of the fragments and blast to be directed toward the target in the manner similar to that disclosed in U. S. Pat. application Ser. No. 182,196, filed Sept. 20, 1971.

The circuit channels can be molded to relatively small sizes and then loaded hydro-statically with secondary explosives such as PBXC-303(I), approaching that of an explosive integrated circuit.

What is claimed is:

1. An explosive logic element comprising:
first and second inputs;
a first and second explosive path extending from said first input;
said first path being shorter than said second path;
said first path terminating at an explosive null gate;
said second path passing through an explosive diode and branching off into third, fourth and fifth explosive paths;
said fourth path passing through a second explosive diode in a reverse direction and thereby terminating;
said third path terminating at said explosive null gate where said first path terminated; and
said fifth path extending across a destructive crossover and branching into sixth and seventh explosive paths;
said seventh path being longer than said sixth path and said sixth and seventh paths crossing each other at a destructive crossover whereby said sixth path reaches a first output and said seventh path is terminated at said second explosive crossover.

2. The device of claim 1 further comprising:
a second input
said second input branching into an eighth explosive path and into said fourth explosive path; said eighth explosive path terminating at a second explosive null gate and said fourth explosive path passing through said second explosive diode and branching into said second, third and fifth paths;
said second path passing through said first explosive diode in a reverse manner and thereby terminating;
said third path terminating at a second output;

whereby introduction of a detonation wave into said first input results in an output at said first output, introduction of a detonation wave into said second input results in an output at said second output and a simultaneous introduction of a detonation wave into said first and second input results in a third distinct output.

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