



US005734334A

**United States Patent** [19]  
**Hsieh et al.**

[11] **Patent Number:** 5,734,334  
[45] **Date of Patent:** Mar. 31, 1998

[54] PROGRAMMABLE PORT FOR CROSSBAR SWITCH	5,202,593	4/1993	Huang et al.	326/86
	5,282,271	1/1994	Hsieh et al.	
	5,426,738	6/1995	Hsieh et al.	326/38
[75] Inventors: Wen-Jai Hsieh; Chi-Song Horng; Chun Chiu Daniel Wong, all of Palo Alto; Gerchih Chou, San Jose; Shrikant Sathe, Saratoga; Kent Dahlgren, San Jose, all of Calif.	5,428,750	6/1995	Hsieh et al.	
	5,428,800	6/1995	Hsieh et al.	
	5,465,056	11/1995	Hsieh et al.	326/41
	5,530,814	6/1996	Wong et al.	395/312
	5,555,971	9/1996	Hsieh et al.	395/312
	5,625,780	4/1997	Hsieh et al.	395/311
[73] Assignee: I-Cube, Inc., Campbell, Calif.				

[21] Appl. No.: 516,320  
[22] Filed: Aug. 17, 1995

Primary Examiner—Edwin C. Holloway, III  
Attorney, Agent, or Firm—Smith-Hill and Bedell

**Related U.S. Application Data**

- [63] Continuation-in-part of Ser. No. 333,484, Nov. 2, 1994, Pat. No. 5,625,780, which is a continuation-in-part of Ser. No. 171,752, Dec. 21, 1993, Pat. No. 5,426,738, which is a continuation of Ser. No. 785,082, Oct. 30, 1991, abandoned.
- [51] Int. Cl.<sup>6</sup> ..... H04Q 1/00
- [52] U.S. Cl. .... 340/827; 340/825.79; 340/825.83; 395/311; 395/312; 326/82; 326/38; 326/41; 326/86
- [58] Field of Search ..... 340/826, 827, 340/825.79, 825.83; 395/275, 309, 311, 312; 326/86, 82, 38, 41, 39

[57] **ABSTRACT**

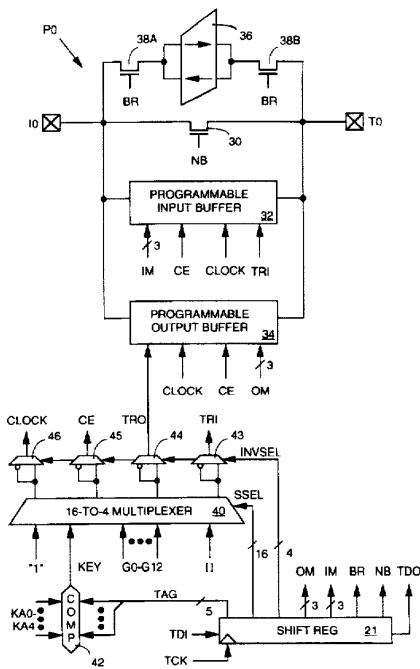
An electronic crossbar switch employs a switch array for selectively routing digital and analog signals between its terminals. A separate port for each terminal provides a path for digital and analog signals flowing in and out of the switch. Each port can be configured to operate with or without tristate buffering under control of a tristate control signal, to optionally latch input or output signals in response to clock and clock enable signals, and to buffer signals passing in or out of the switch terminal with or without an input direction control signal. A set of control inputs are provided in common to all ports, allowing an external host to transmit control signals in parallel to each port. Each port may be programmed to select any of its control inputs as its tristate, clock enable, clocking or direction control signal.

[56] **References Cited**

**U.S. PATENT DOCUMENTS**

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**12 Claims, 4 Drawing Sheets**



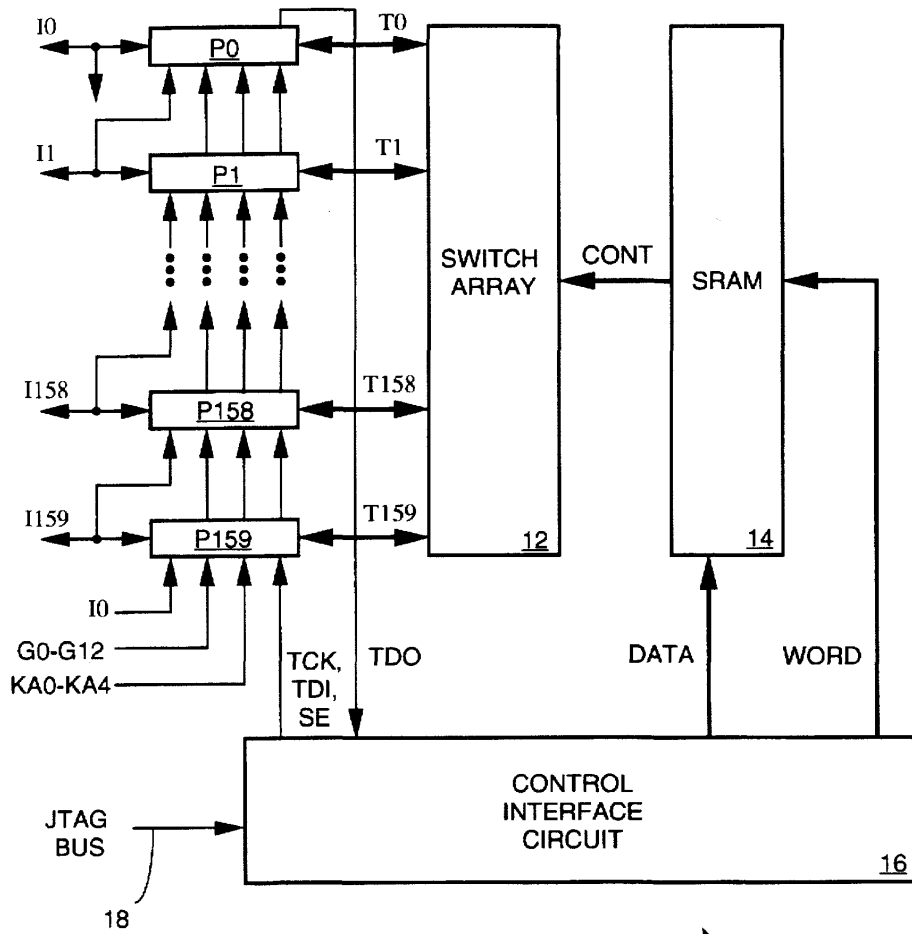


FIG. 1

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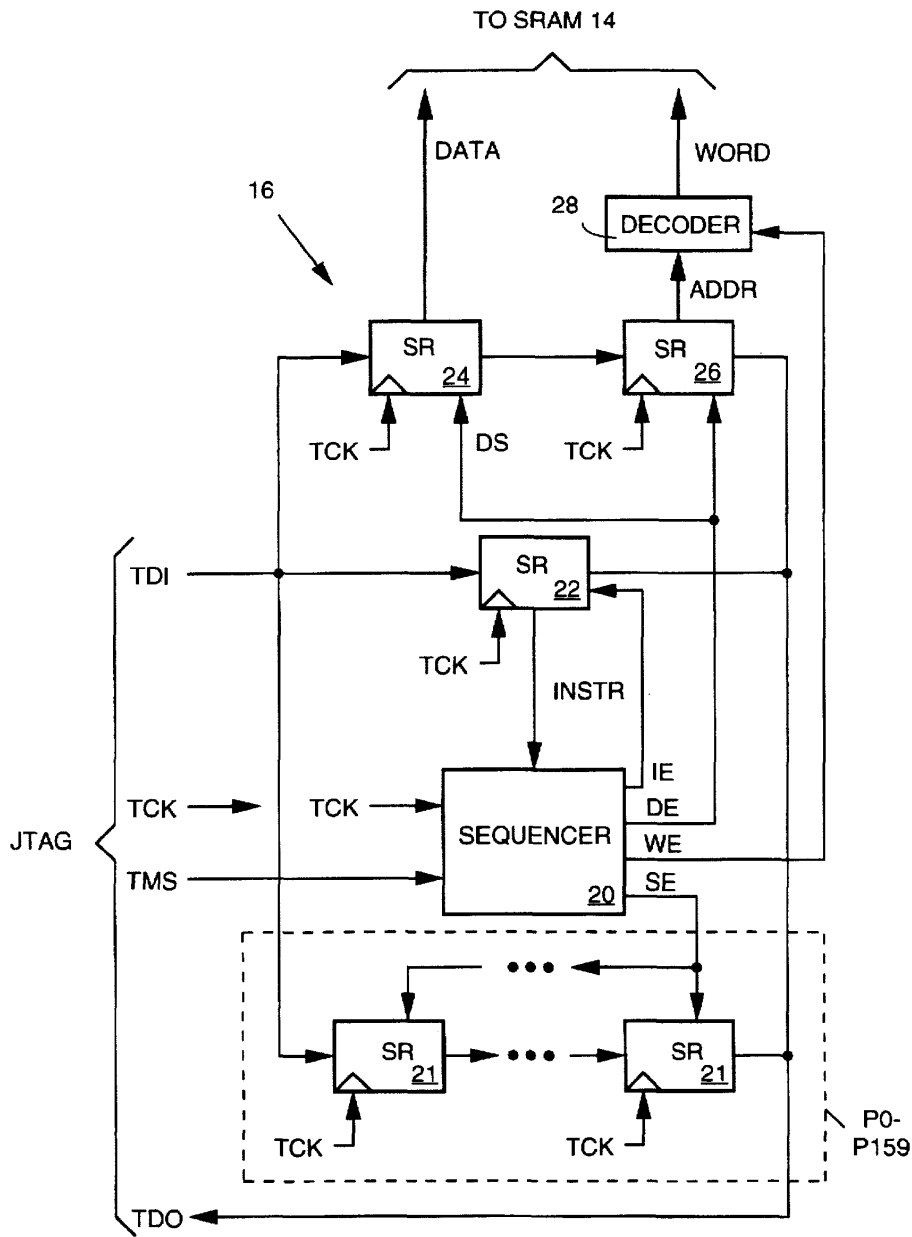


FIG. 2





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