United States Patent [19]

Gates

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[54] **FORWARD ERROR CORRECTION SYSTEM**

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[73] Assignee: **TIW Systems, Inc.**, Sunnyvale, Calif.

[21] Appl. No.: **77,800**

[22] Filed: **Jul. 27, 1987**

[51] **Int. Cl.**[4] **G06F 11/10**

[52] **U.S. Cl.** **371/43**

[58] **Field of Search** 371/43, 44, 45, 46

[56] **References Cited**

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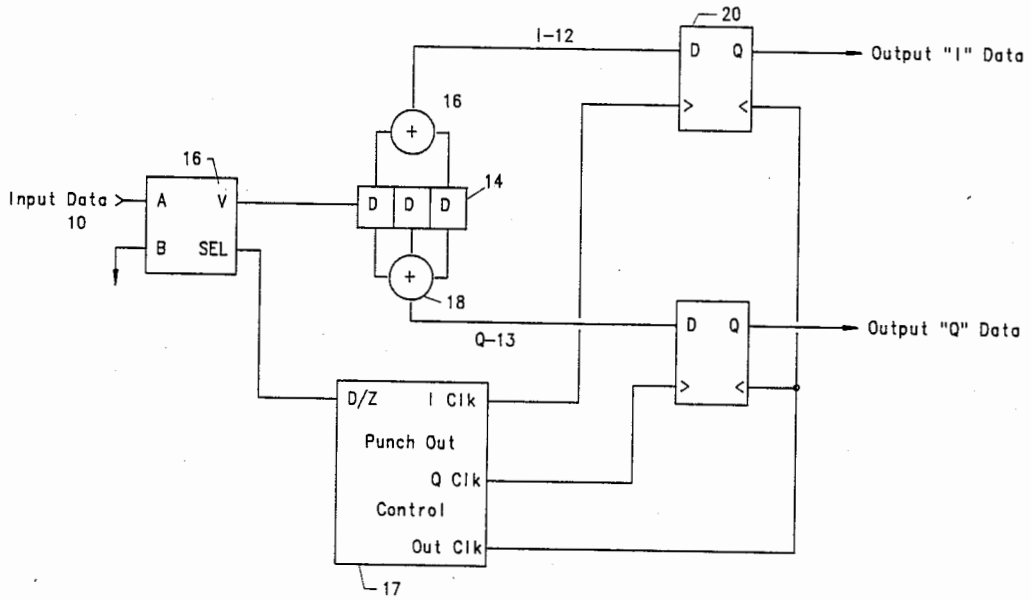
Primary Examiner—Charles E. Atkinson
Attorney, Agent, or Firm—Flehr, Hohbach, Test, Albritton & Herbert

[57] **ABSTRACT**

The system first incorporates an encoder which utilizes a ½ rate convolutional encoder to encode the data and a supplementary coding system for converting the ½ rate coded data to a nominal ¾ rate. Thereafter, in order that the encoded data fits within the fixed frame length which has been adopted as a standard for the present TDMA transmission system, a portion of the excess data in each frame of encoded data put out by the encoder must be deleted or punched out. These bits are spaced throughout the frame to minimize the effect of the punchout routine.

On the decoding side of the system, bits must be reinserted in the same place where they were deleted in the encoder. Because these bits were removed at the encoder, the decoder cannot possibly know what they were. It is not important to know what they were, but rather when in the received bit stream they would have occurred. In these places, place holding bits that are marked as such are inserted. This function is achieved by arbitrarily inserting either 1's or 0's in the bit stream, and providing an accompanying bit stream which incorporates flag bits for marking the existence of these place holding bits. Later processing in the decoder then simply treats these bits as place holders. That is, they do not add information that can help correct errors, nor do they cause errors.

19 Claims, 5 Drawing Sheets



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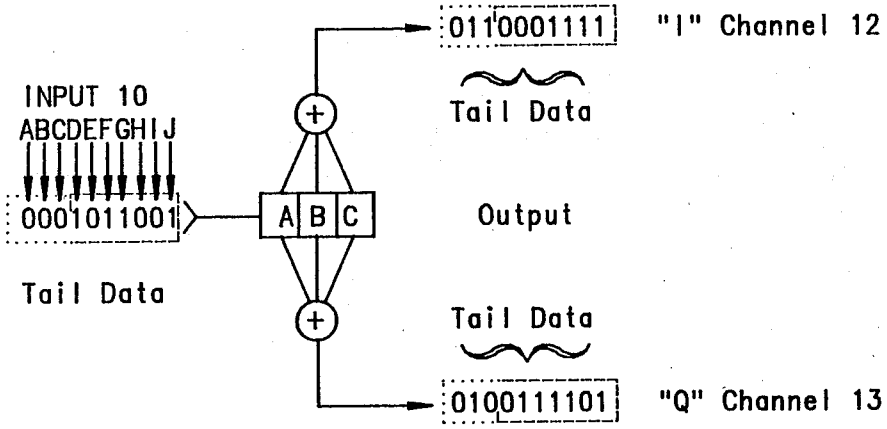

Fig. 1A

FEC Encoder R = 1/2 = .5

Input Data Bits =7

Output Data Bits = 20

Actual Code Rate R =7/20 = .35

Transmitted Data

"I" 0 1 1 0 0 0 1 1 1 1

Chosen "PUNCH-OUT" Locations

"Q" 0 1 0 0 1 1 1 1 0 1

Final Transmitted Sequence 19

"I" 0 1 0 0 1 1 1

"Q" 0 1 0 1 1 1 1

Final Statistics

1011001 – 7 Input Data Bits

0100111

0101111

14 Output Data bits

Fig. 1B

"I" B1 B2 B3 B4 B5 B6

"q' B3 B6

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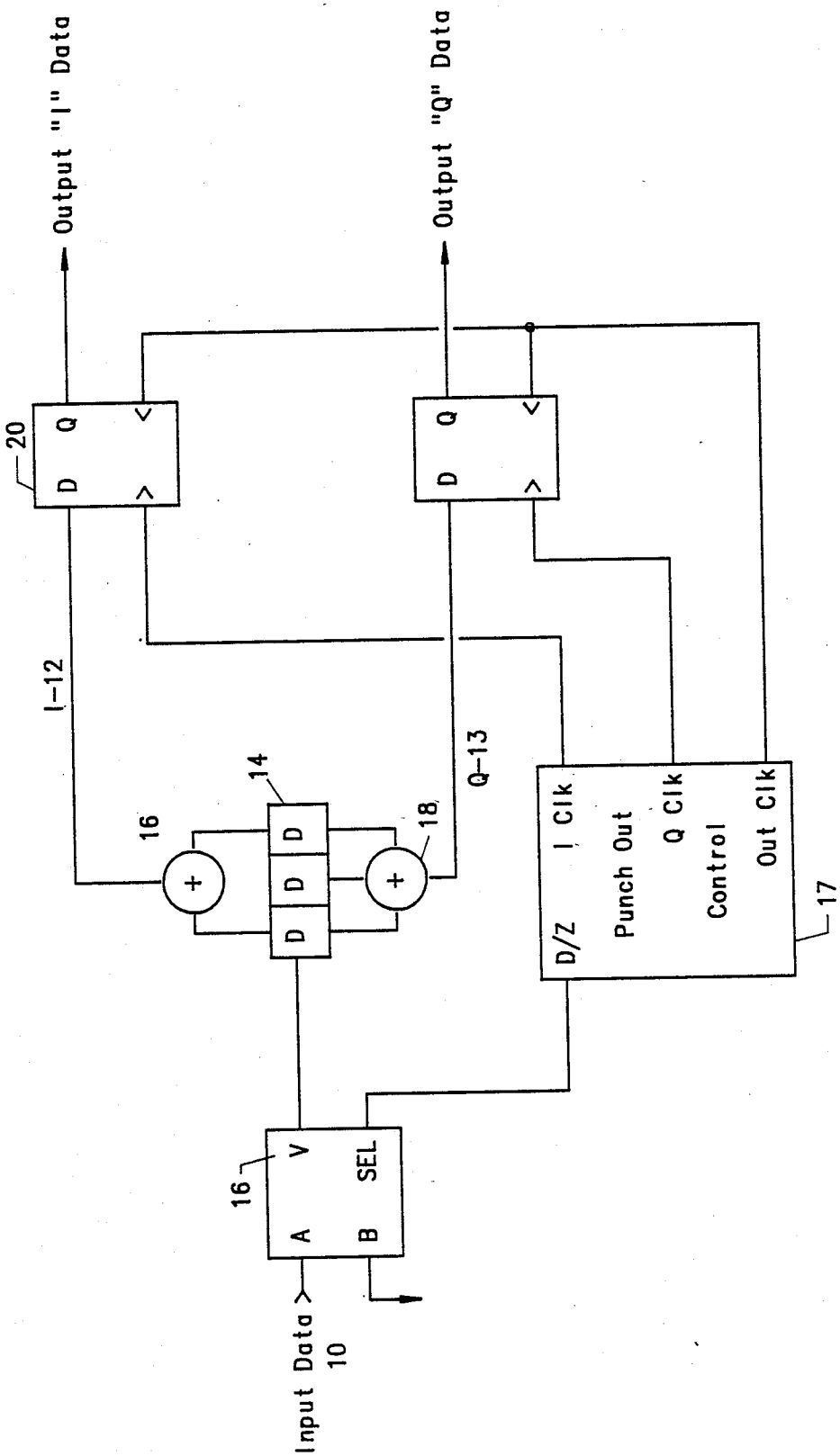

FIG. 2A

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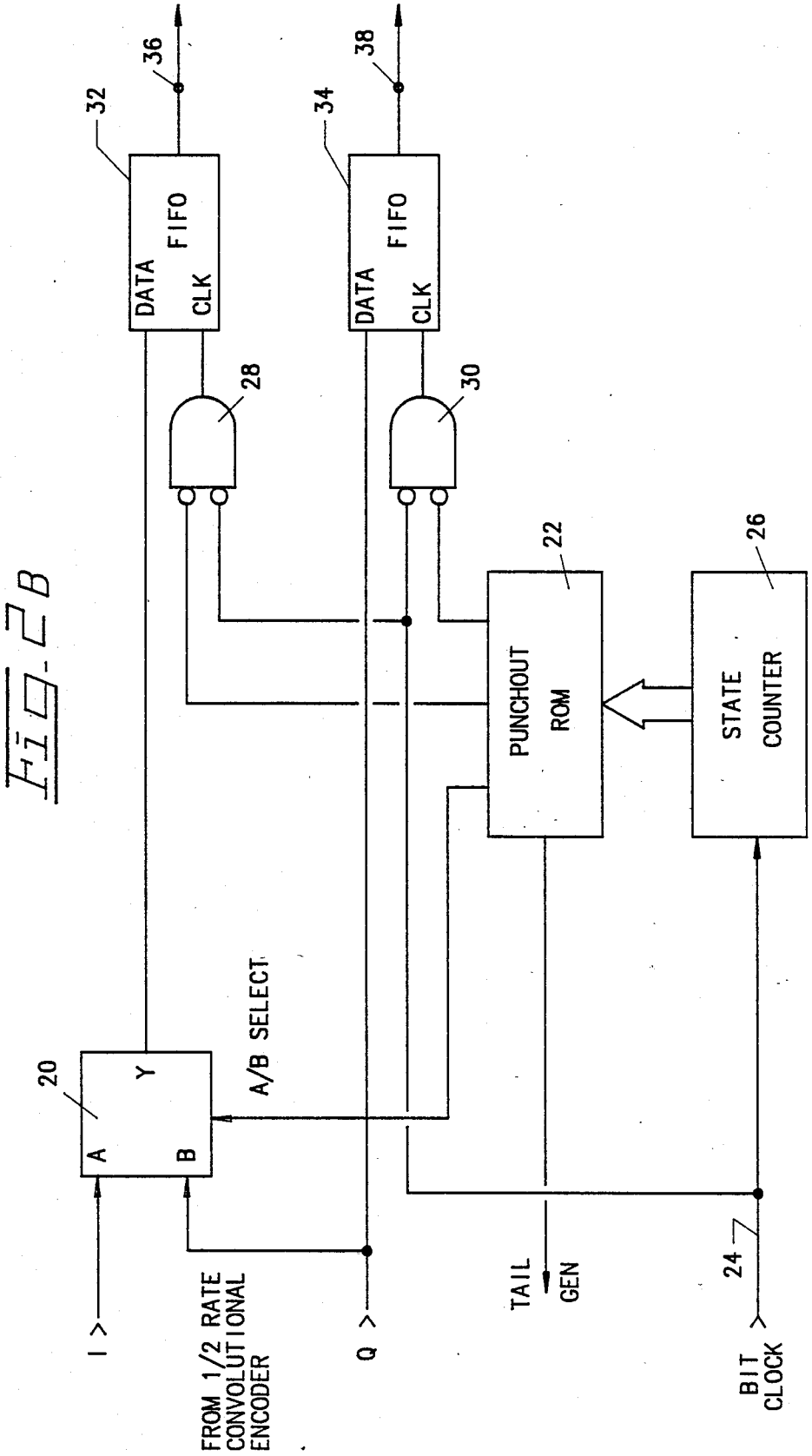

FIG-2B

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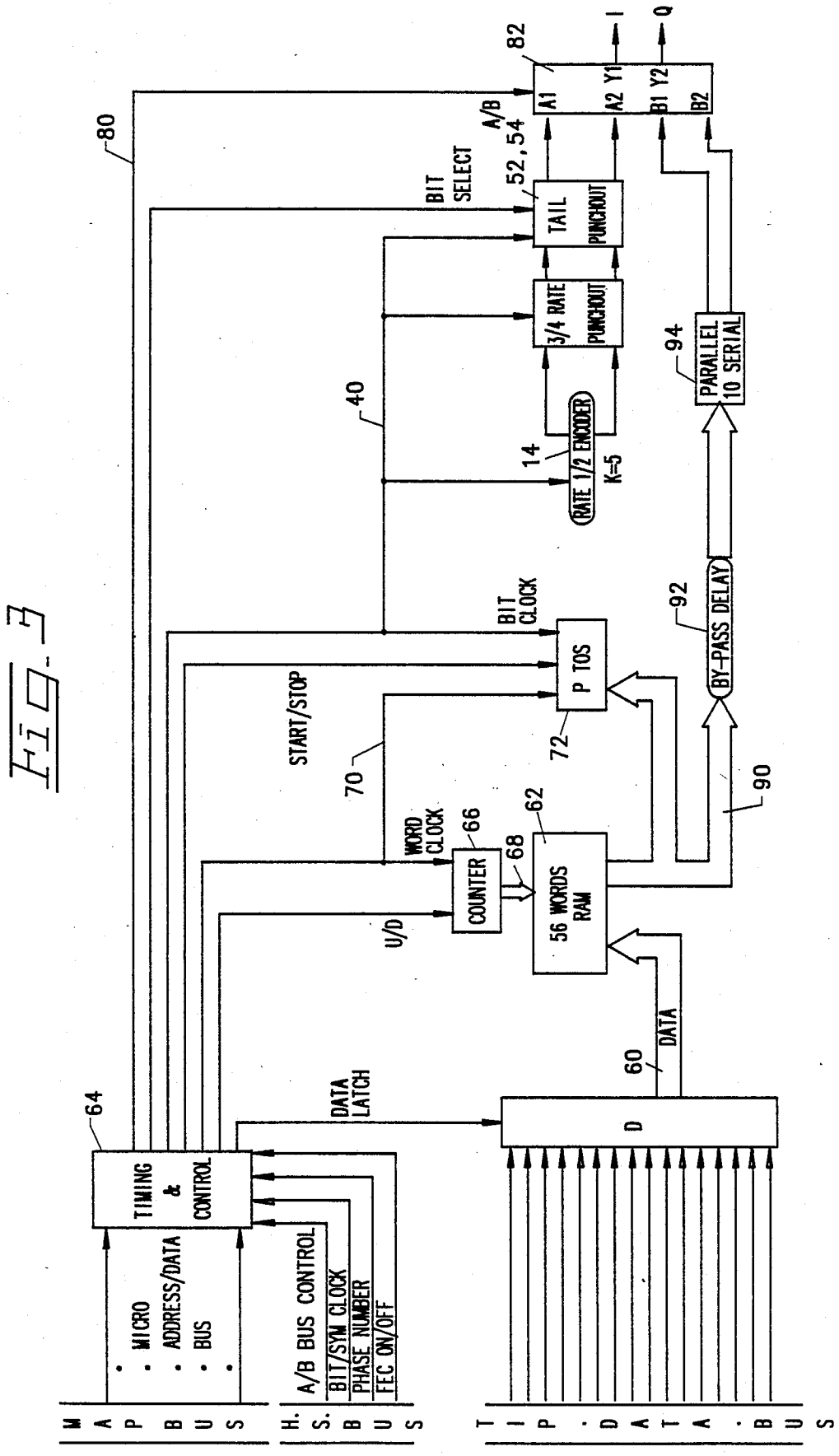

FIG. 7

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