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(12) **United States Patent**  
**Kim et al.**

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(45) **Date of Patent:** Apr. 3, 2007

(54) **INTERLEAVING APPARATUS AND METHOD FOR SYMBOL MAPPING IN AN HSDPA MOBILE COMMUNICATION SYSTEM**

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(73) Assignee: **Samsung Electronics Co., Ltd.** (KR)

(\* ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 583 days.

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(Continued)

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(74) *Attorney, Agent, or Firm*—The Farrell Law Firm

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(57) **ABSTRACT**

(30) **Foreign Application Priority Data**

Dec. 21, 2001 (KR) ..... 10-2001-0083064

In an apparatus for data transmission in a communication system, a turbo encoder encodes data bits to generate systematic bits and parity bits, and a rate matcher matches the systematic bits and parity bits. A first interleaver writes the rate-matched systematic bits on a row by row basis, and performs inter-column permutation. A second interleaver writes the rate-matched parity bits on a row-by-row basis, and performs inter-column permutation. A modulator alternatively collects the permuted bits on a column by column basis from the first and second interleavers, and maps collected bits from the first and second interleavers onto one modulation symbol, wherein a size of the first interleaver is equal to a size of the second interleaver.

(51) **Int. Cl.**

**H03M 13/00** (2006.01)

**H03M 13/03** (2006.01)

(52) **U.S. Cl.** ..... 714/755; 714/786; 714/758; 714/790

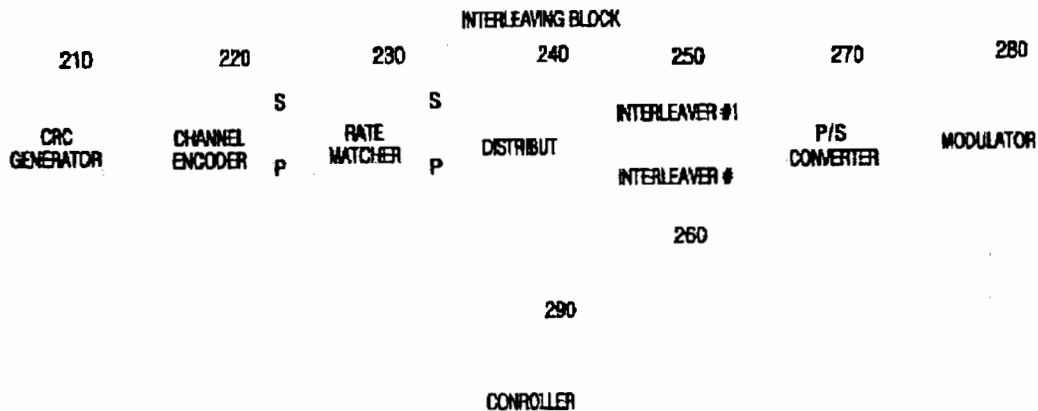
(58) **Field of Classification Search** ..... None  
See application file for complete search history.

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**16 Claims, 27 Drawing Sheets**



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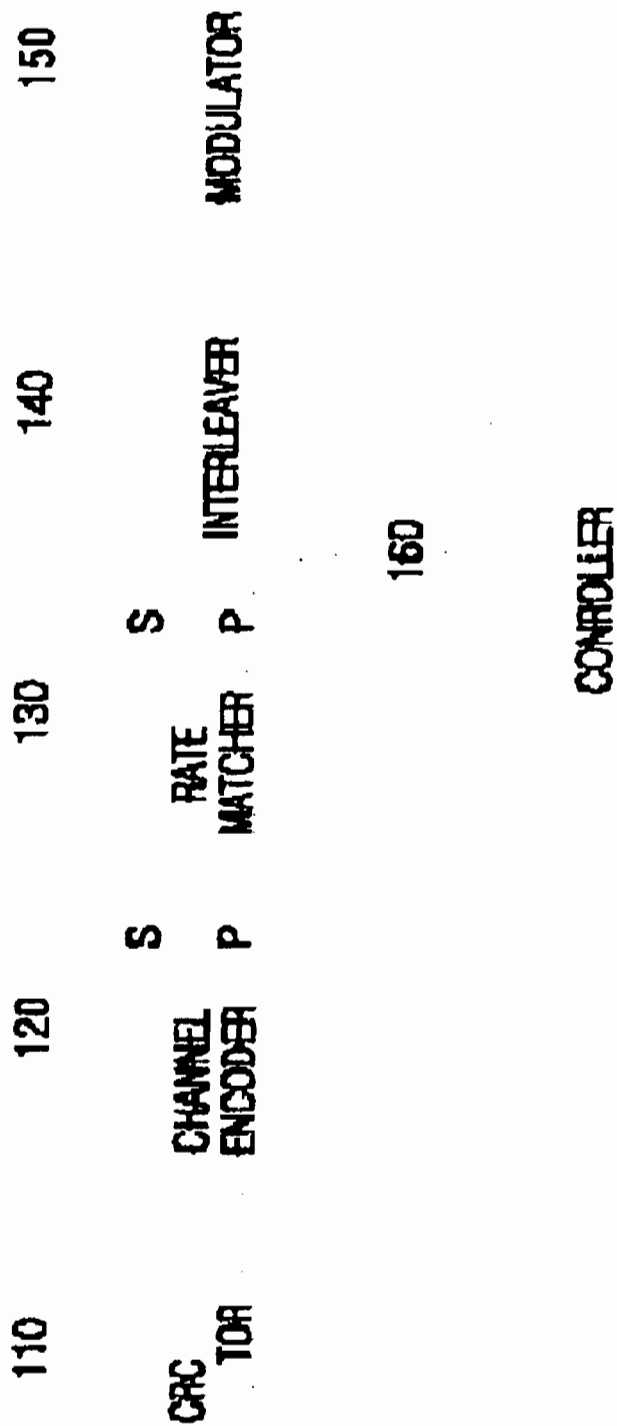
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**FIG.1**  
**(PRIOR ART)**

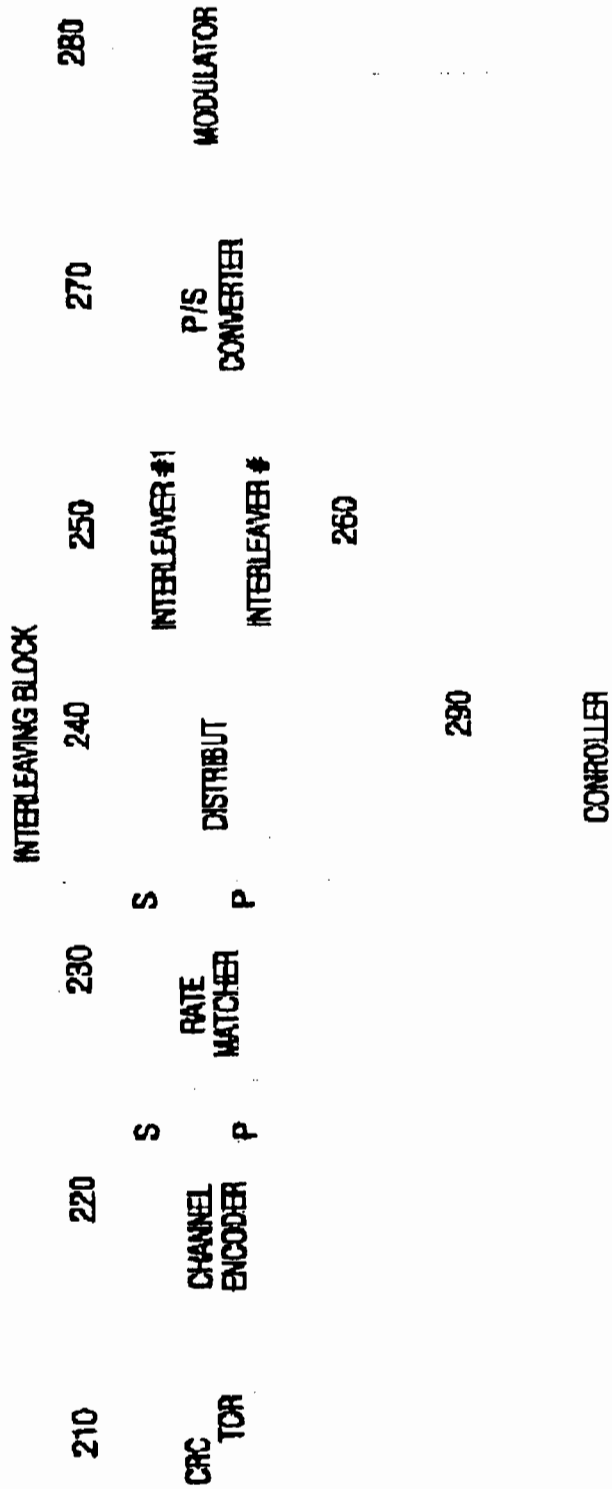


FIG. 2

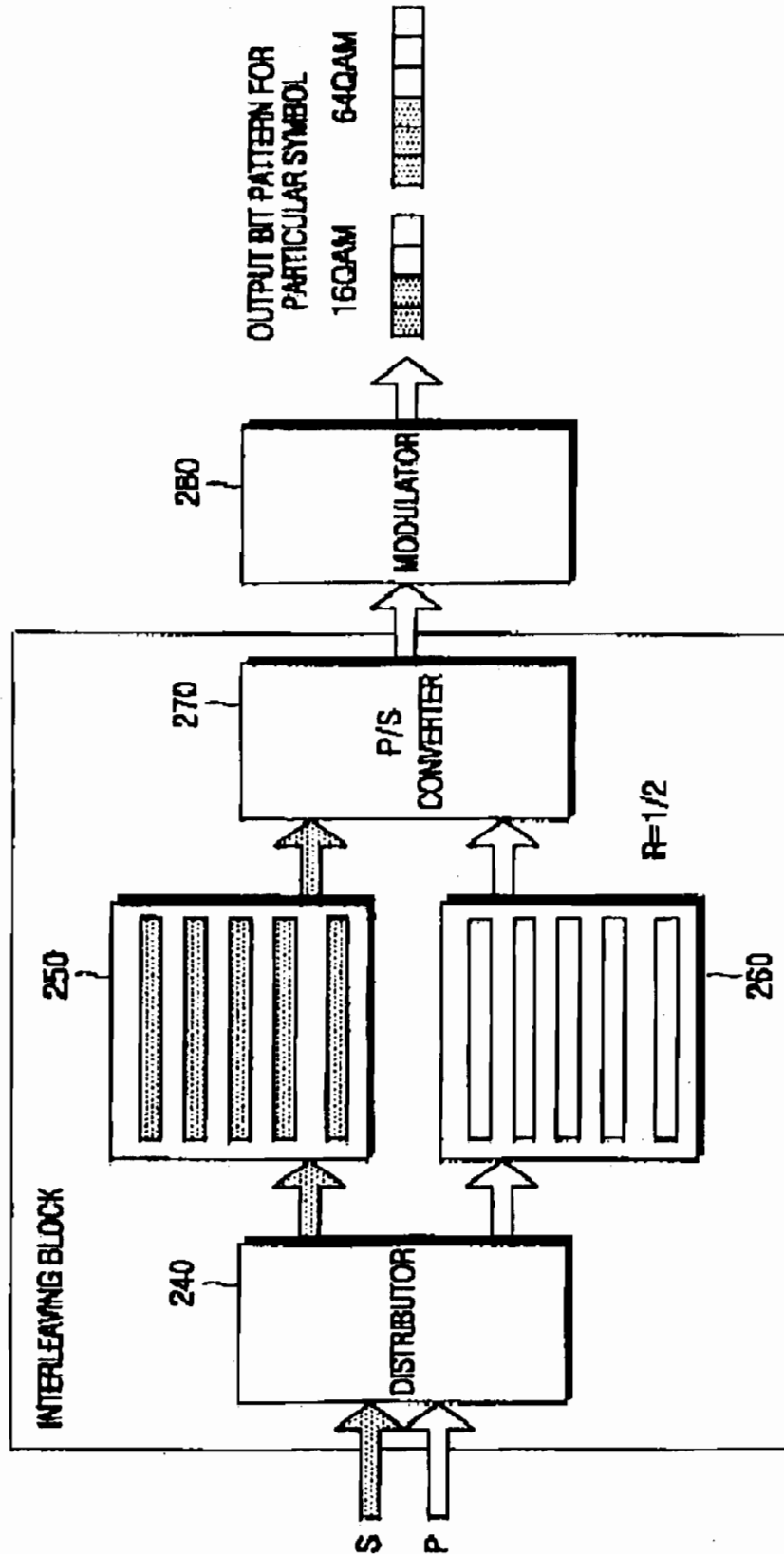


FIG. 3

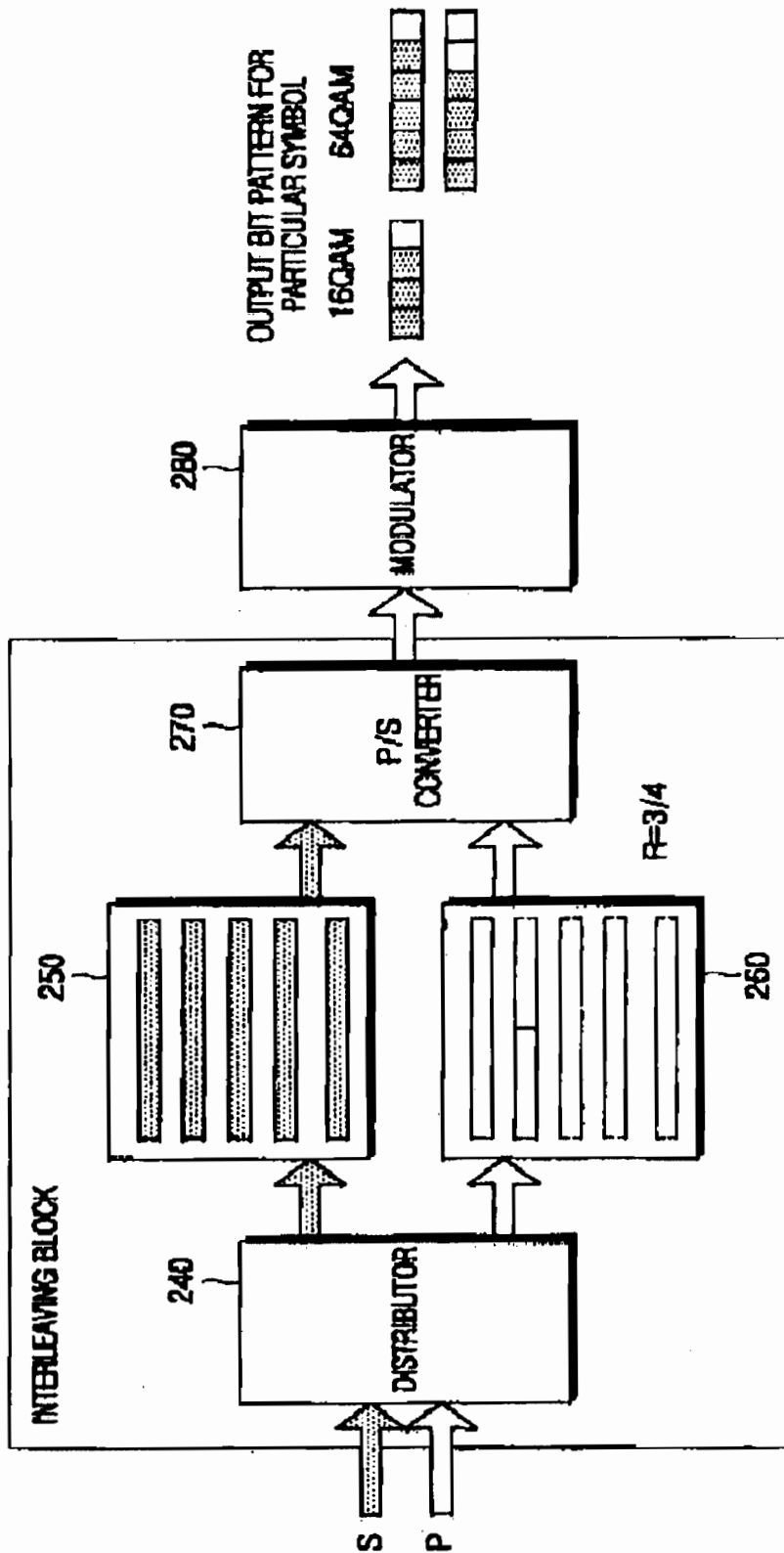


FIG. 4

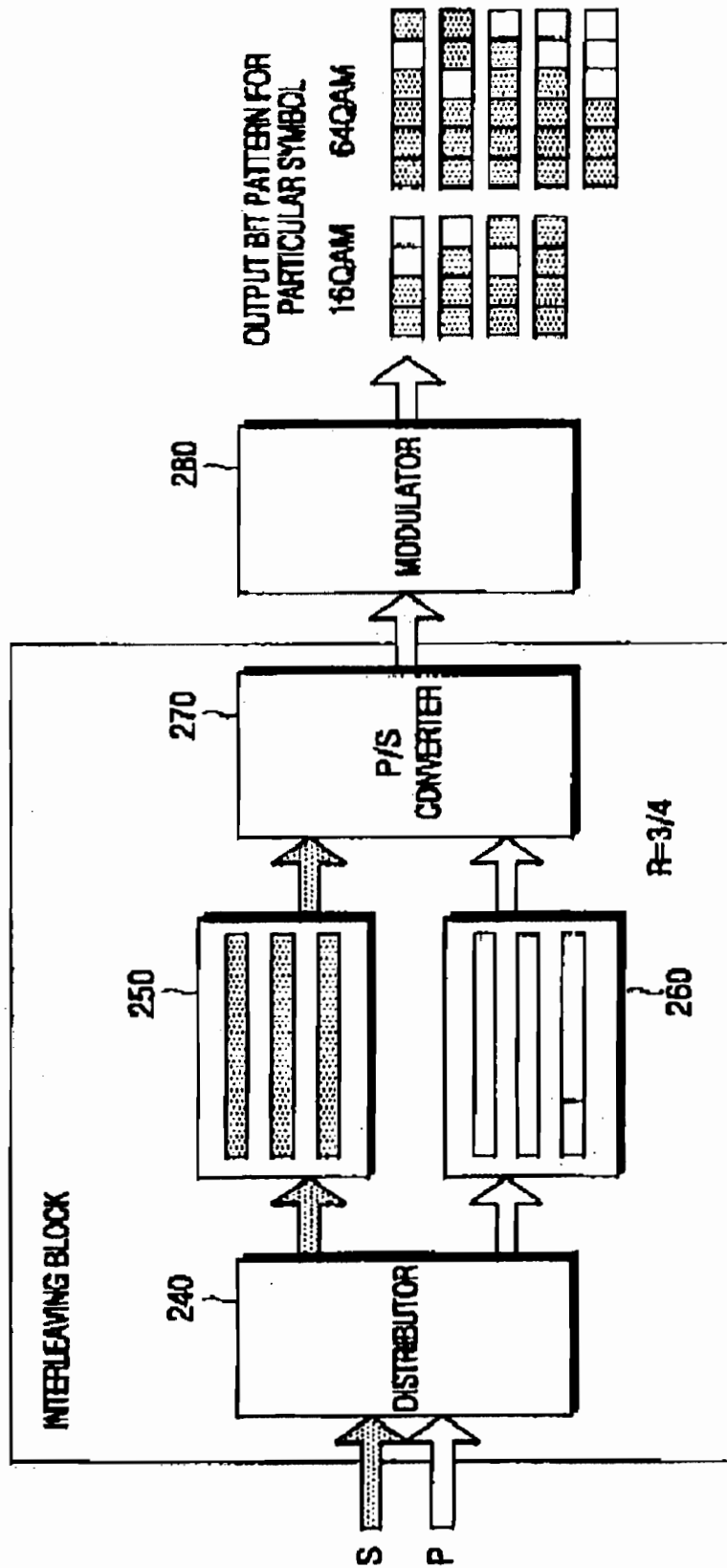


FIG. 5

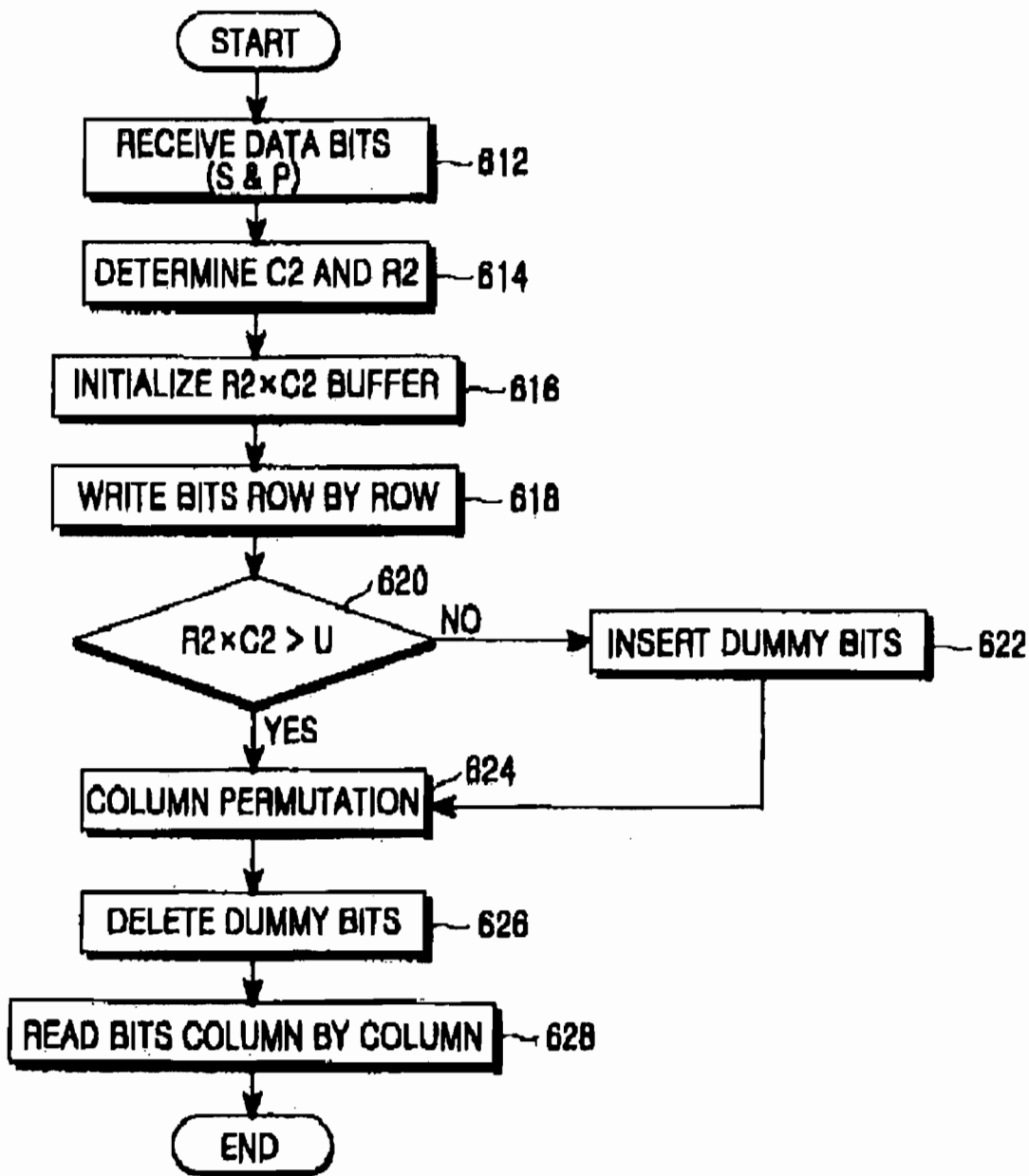


FIG. 6



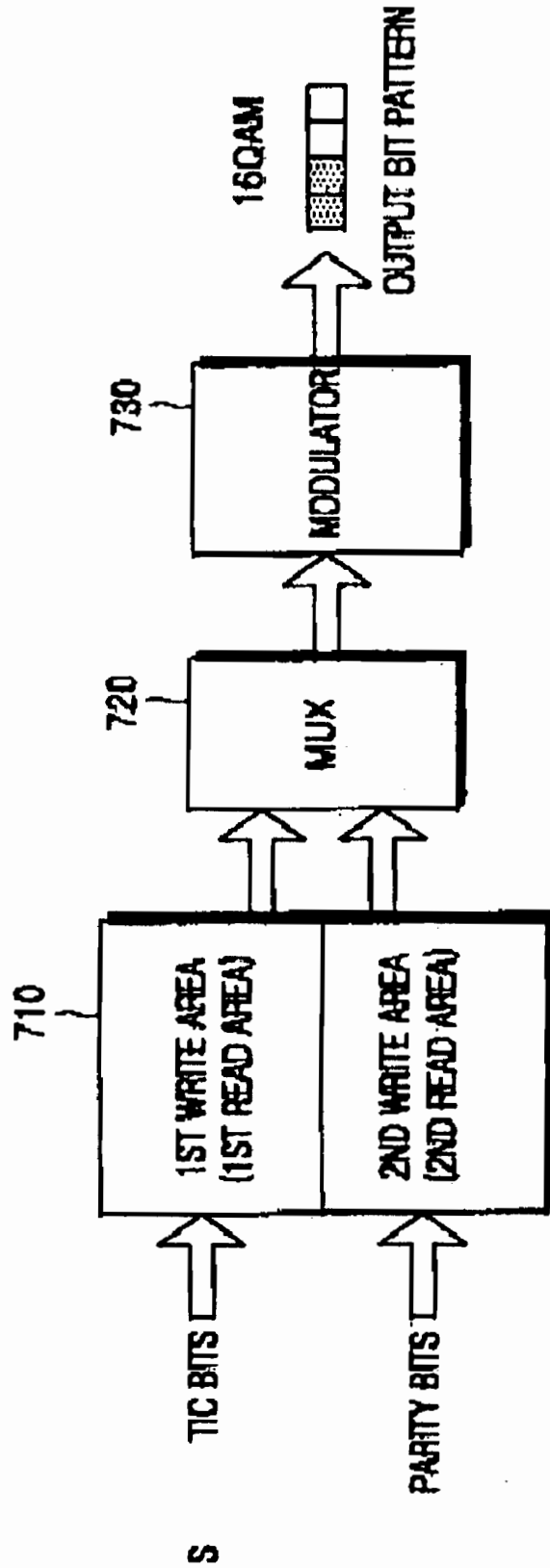
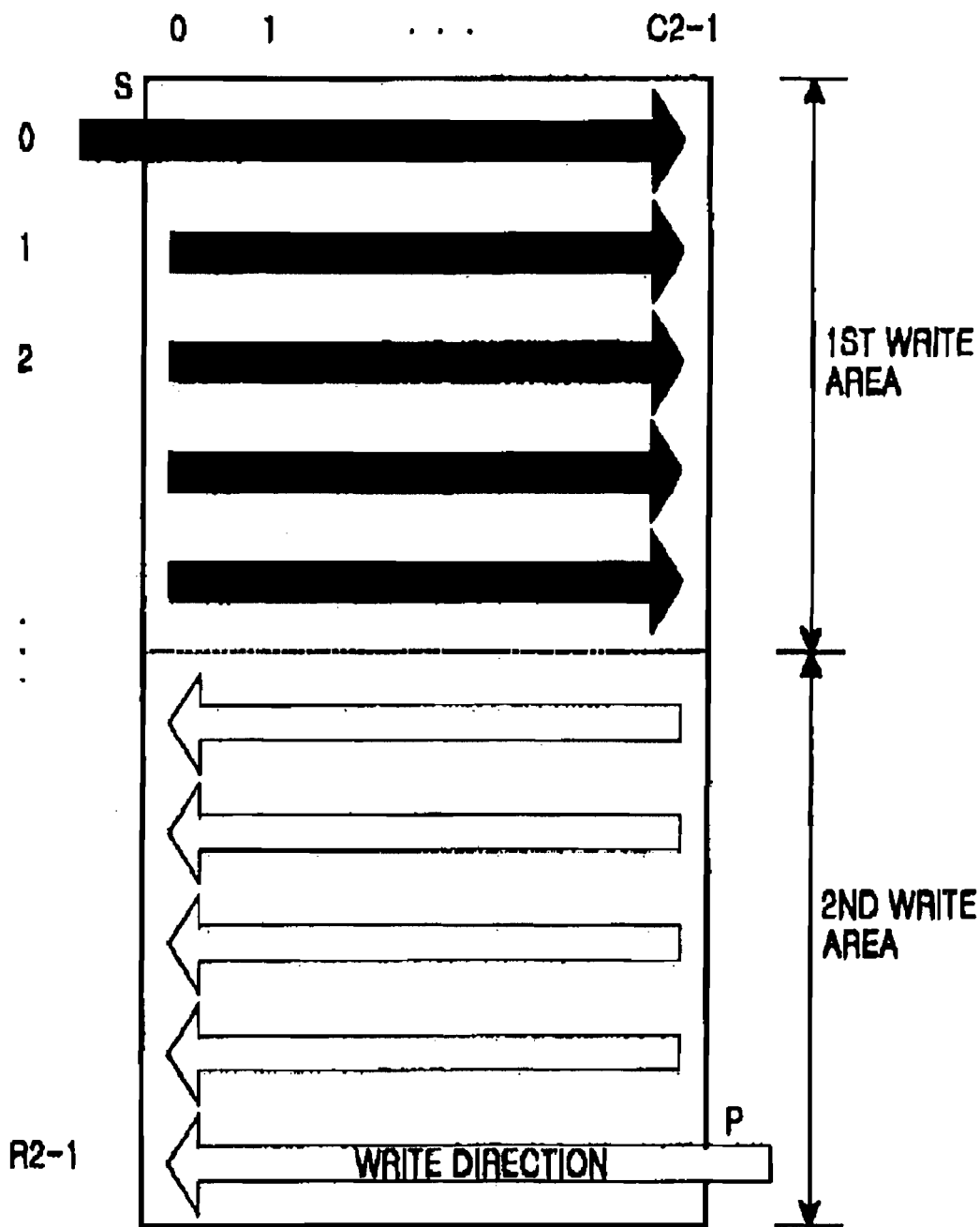
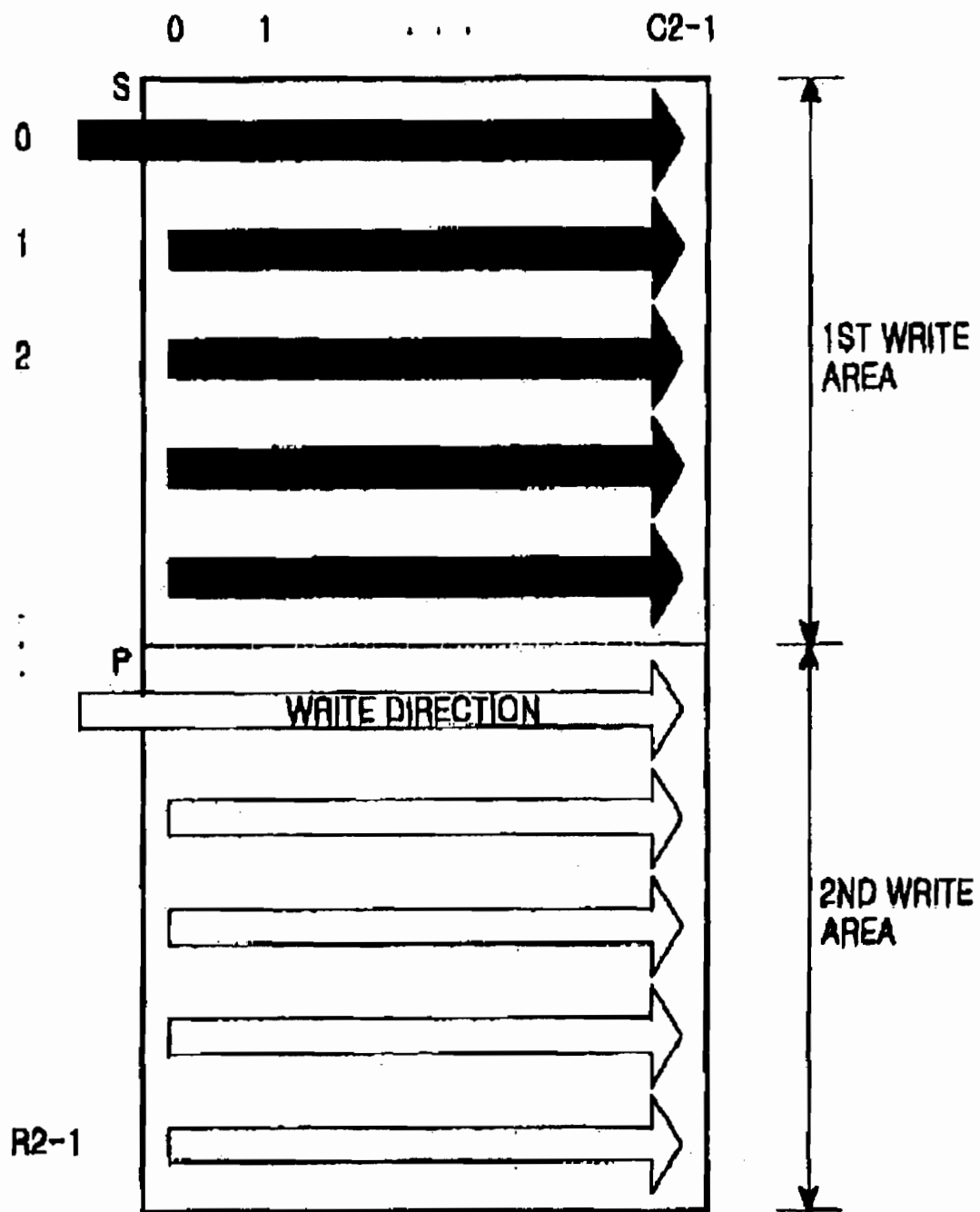


FIG. 7



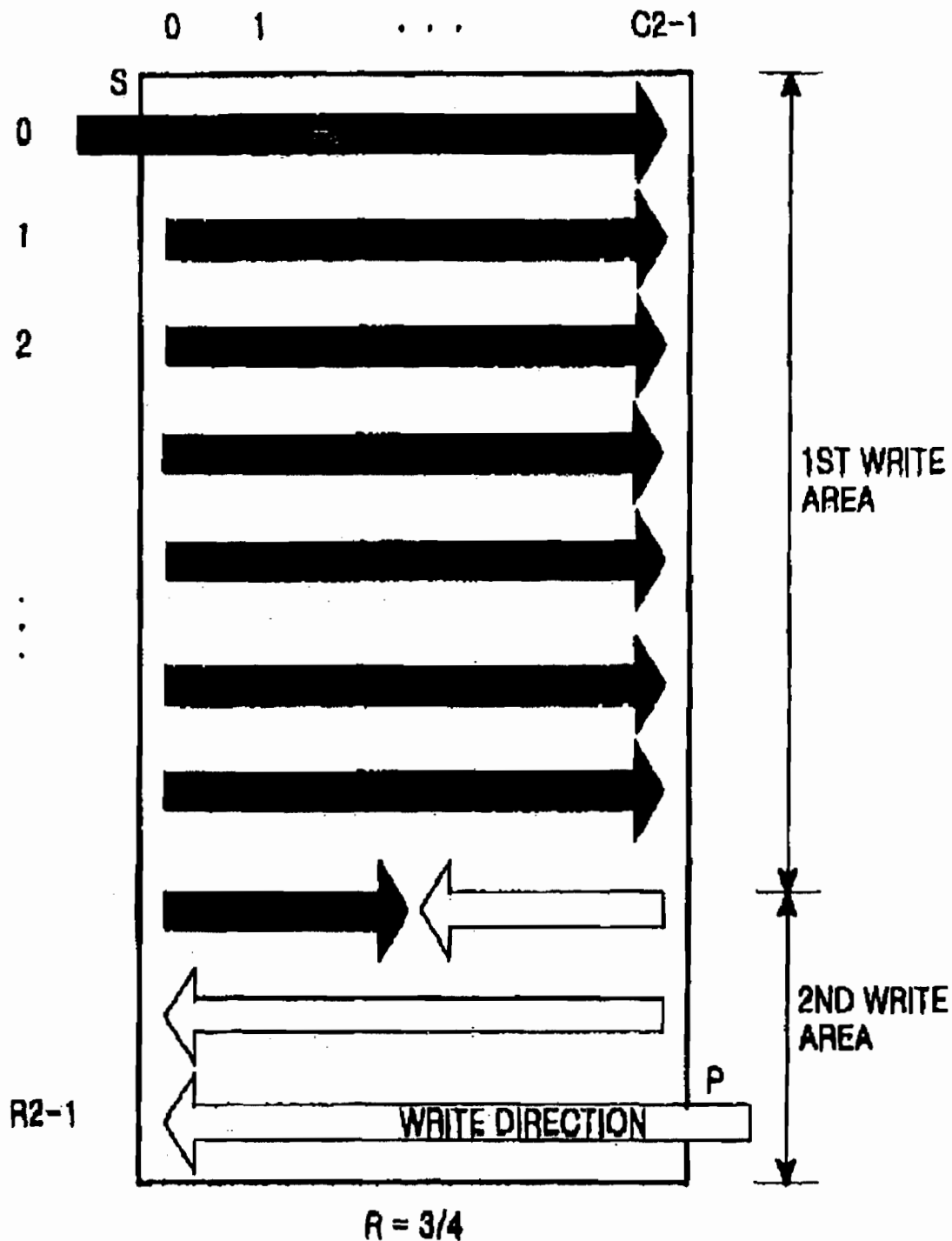
$R = 1/2$

I .8



$$R = 1/2$$

I .8



I .

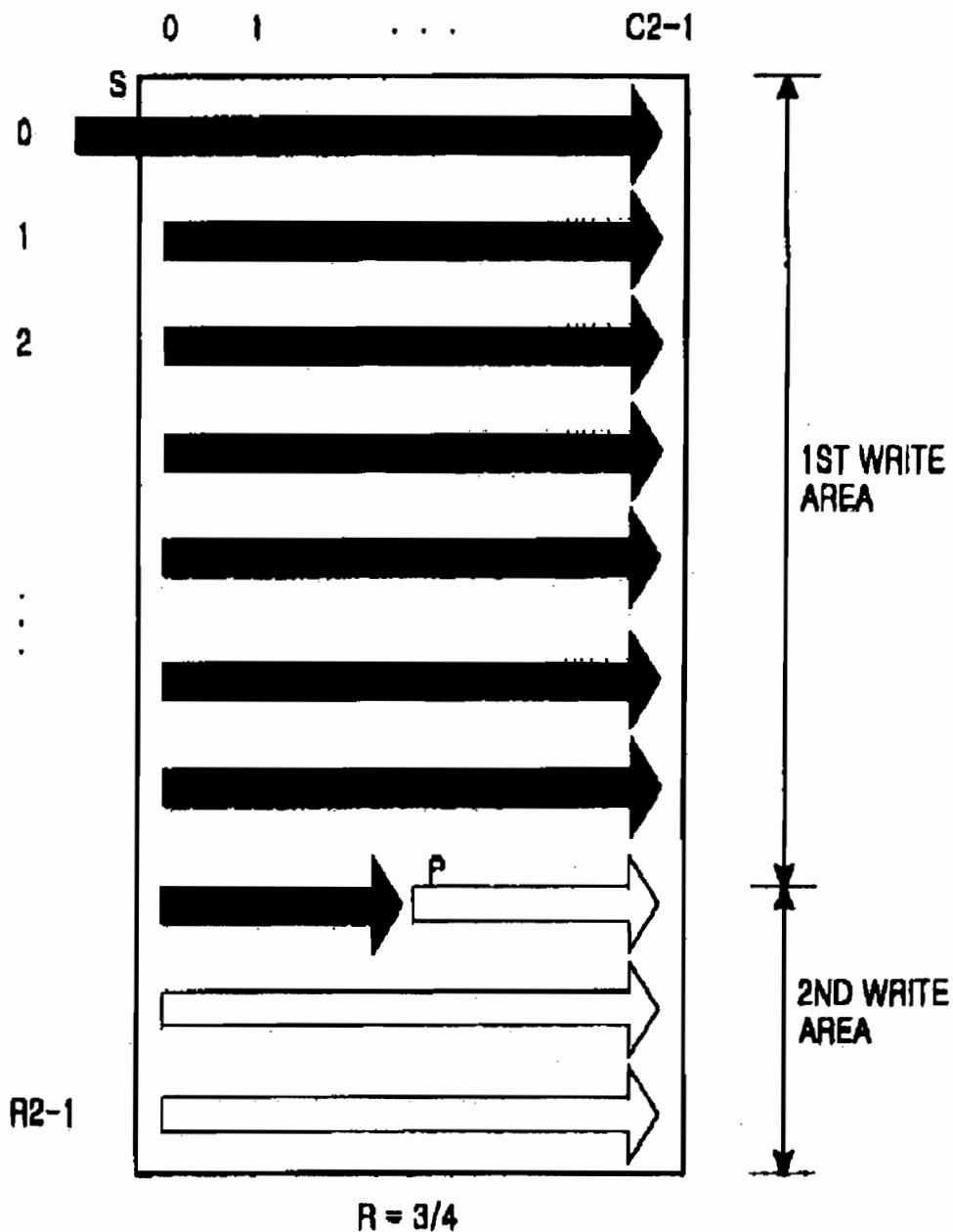
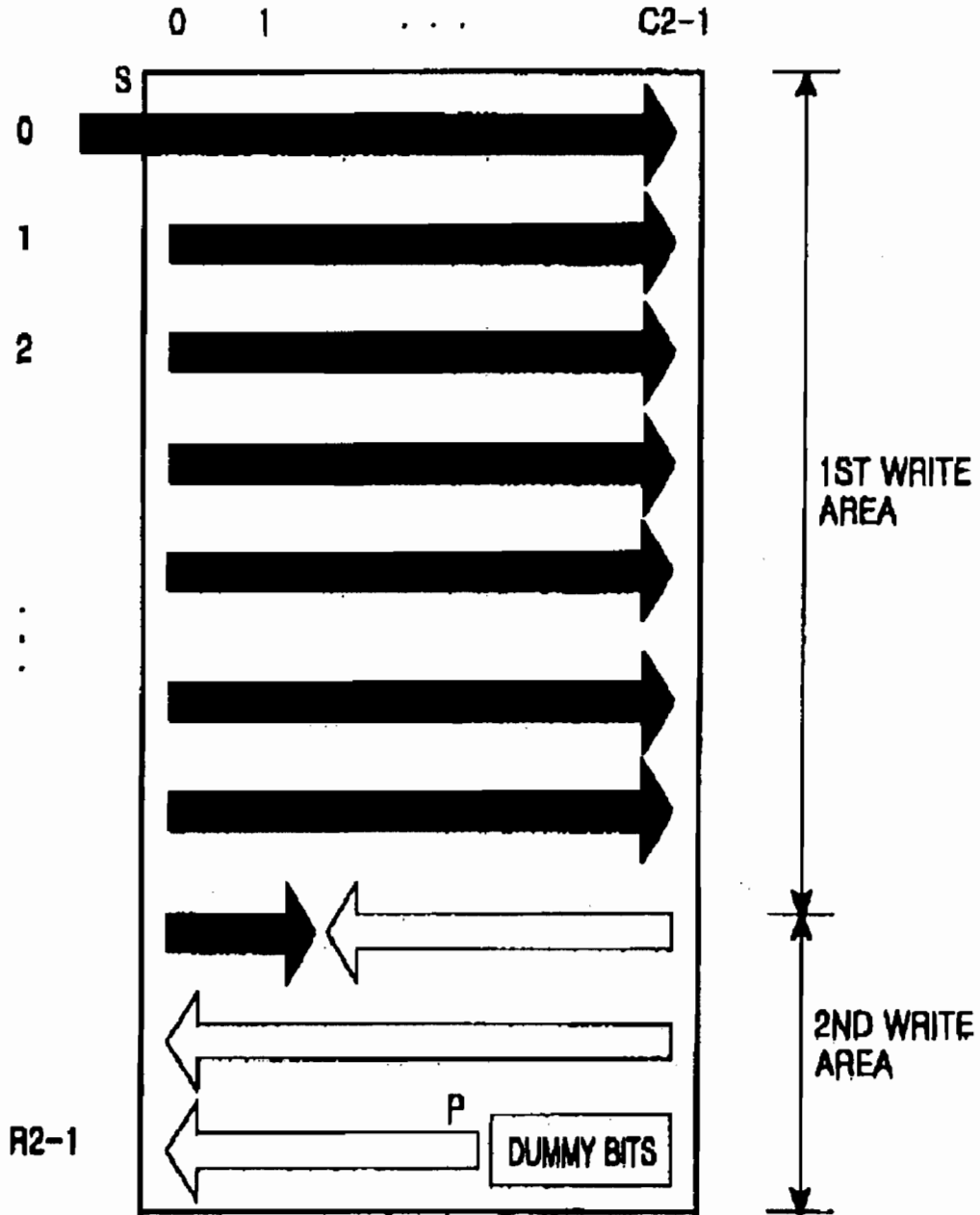
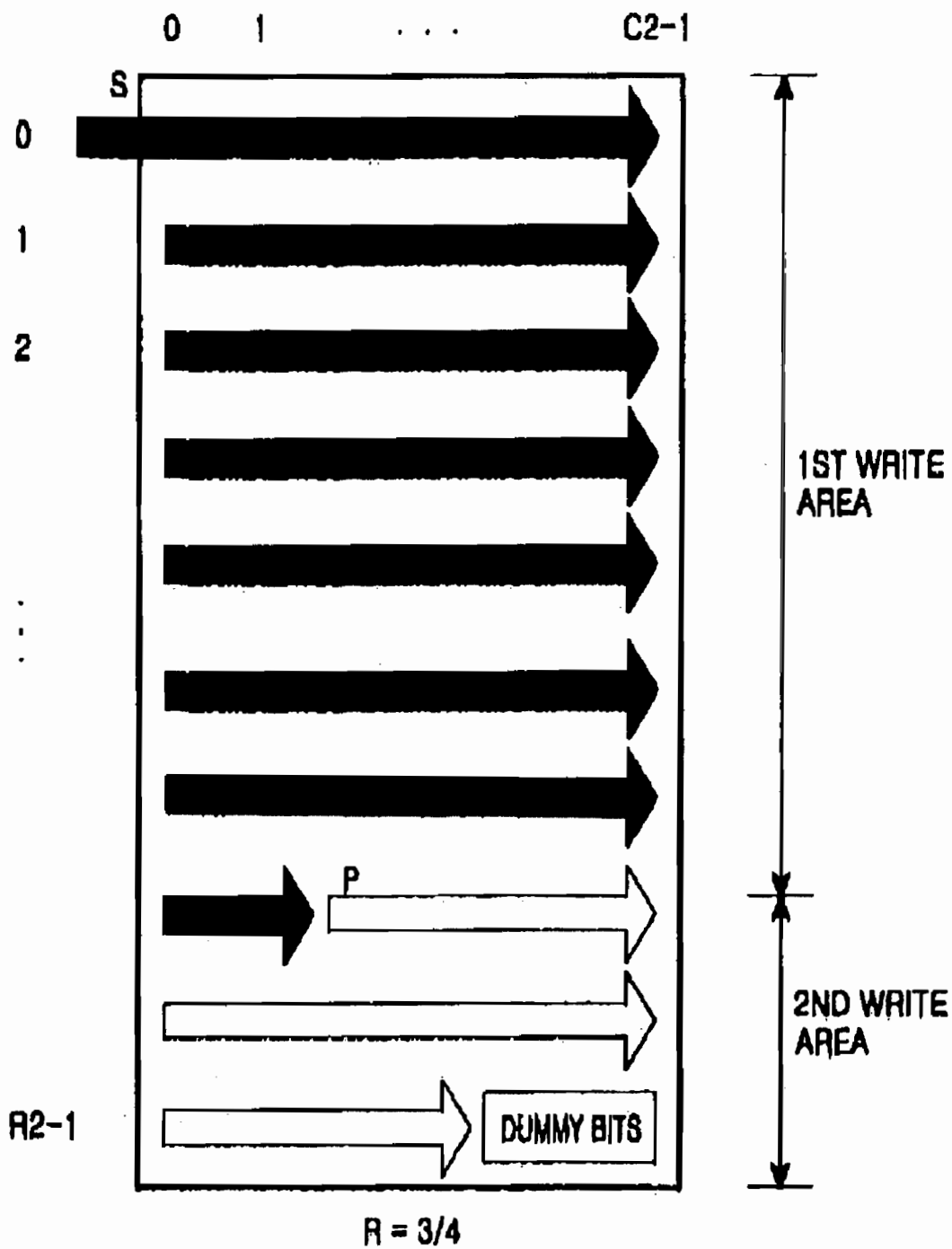


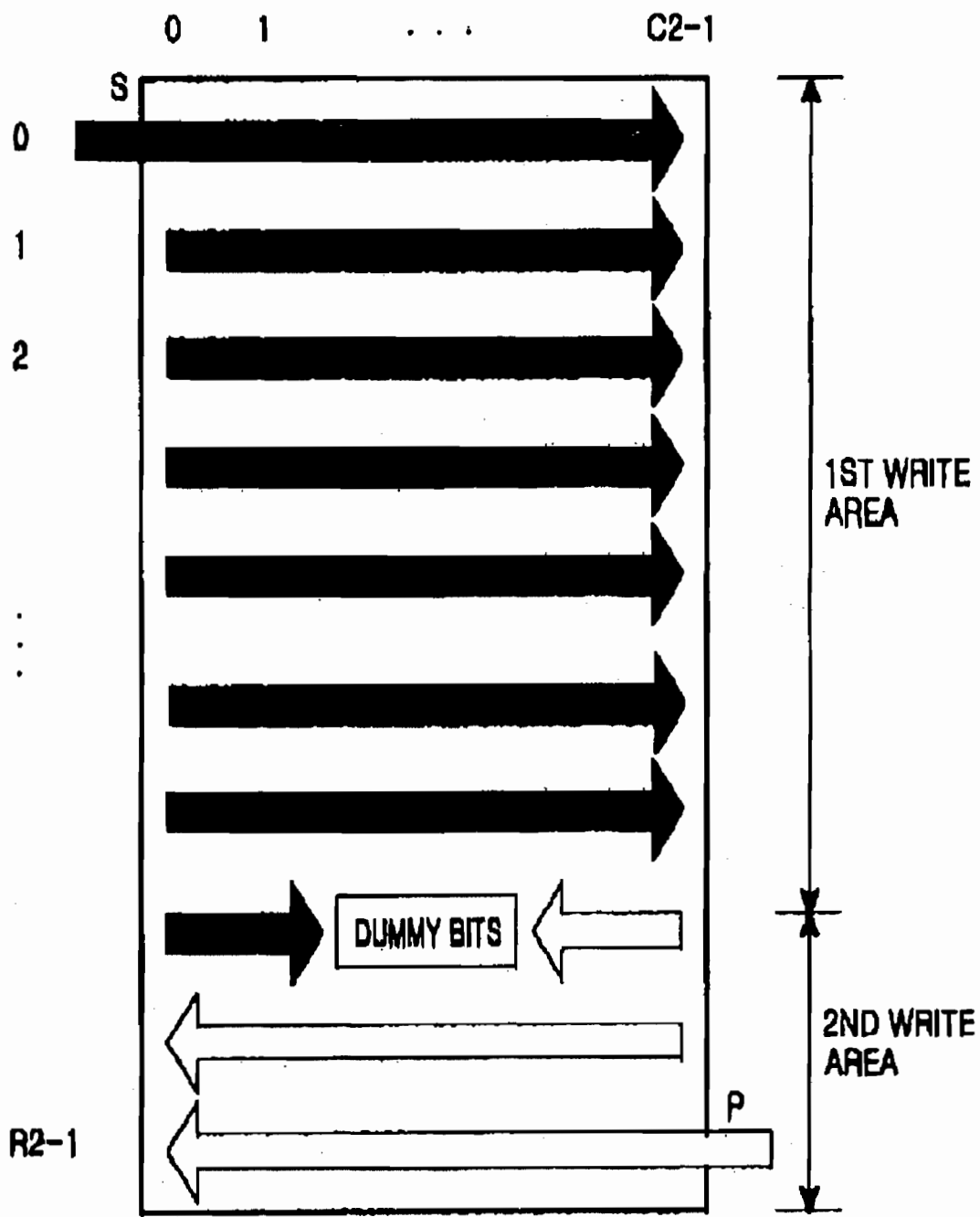
FIG. 9B



I .10



I .10



I .1



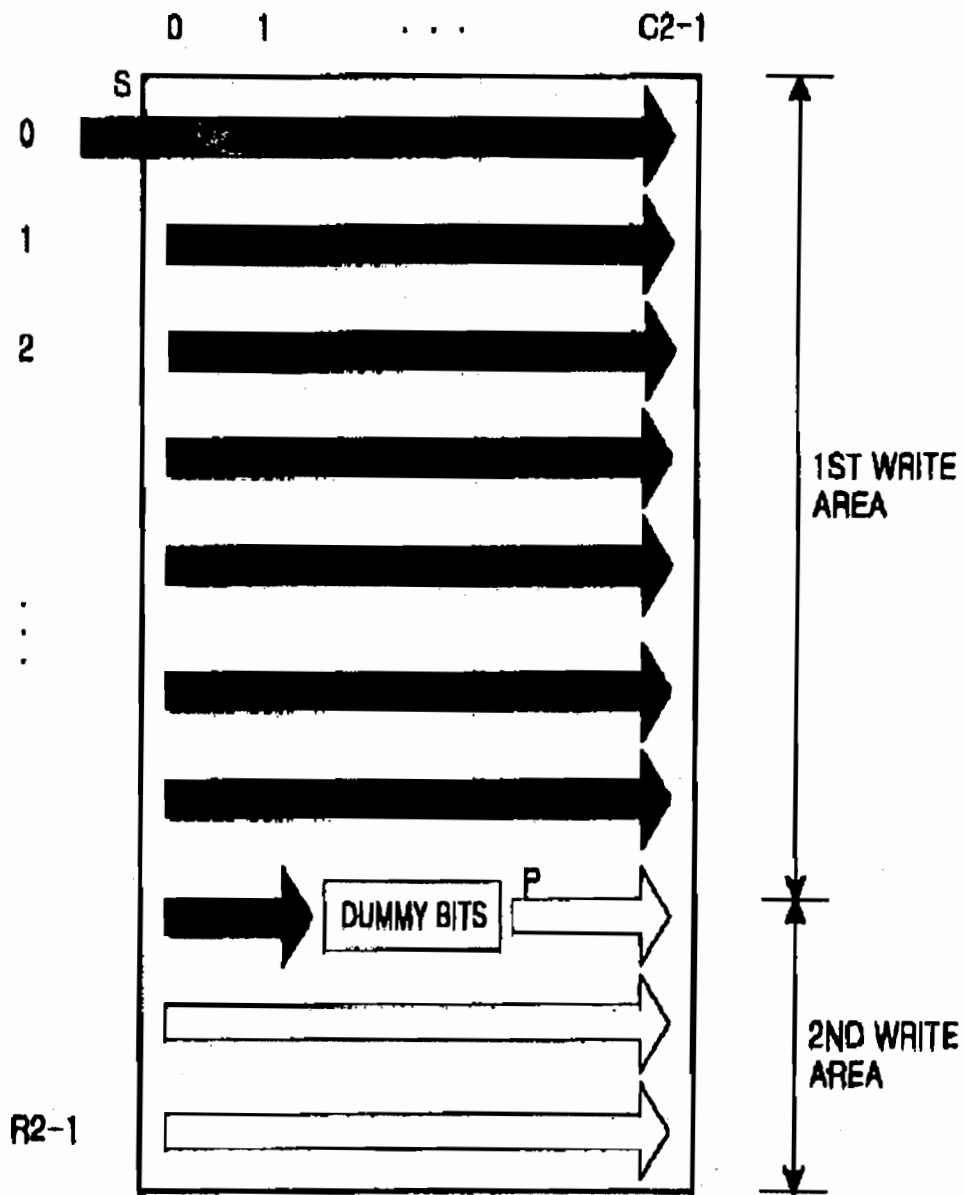
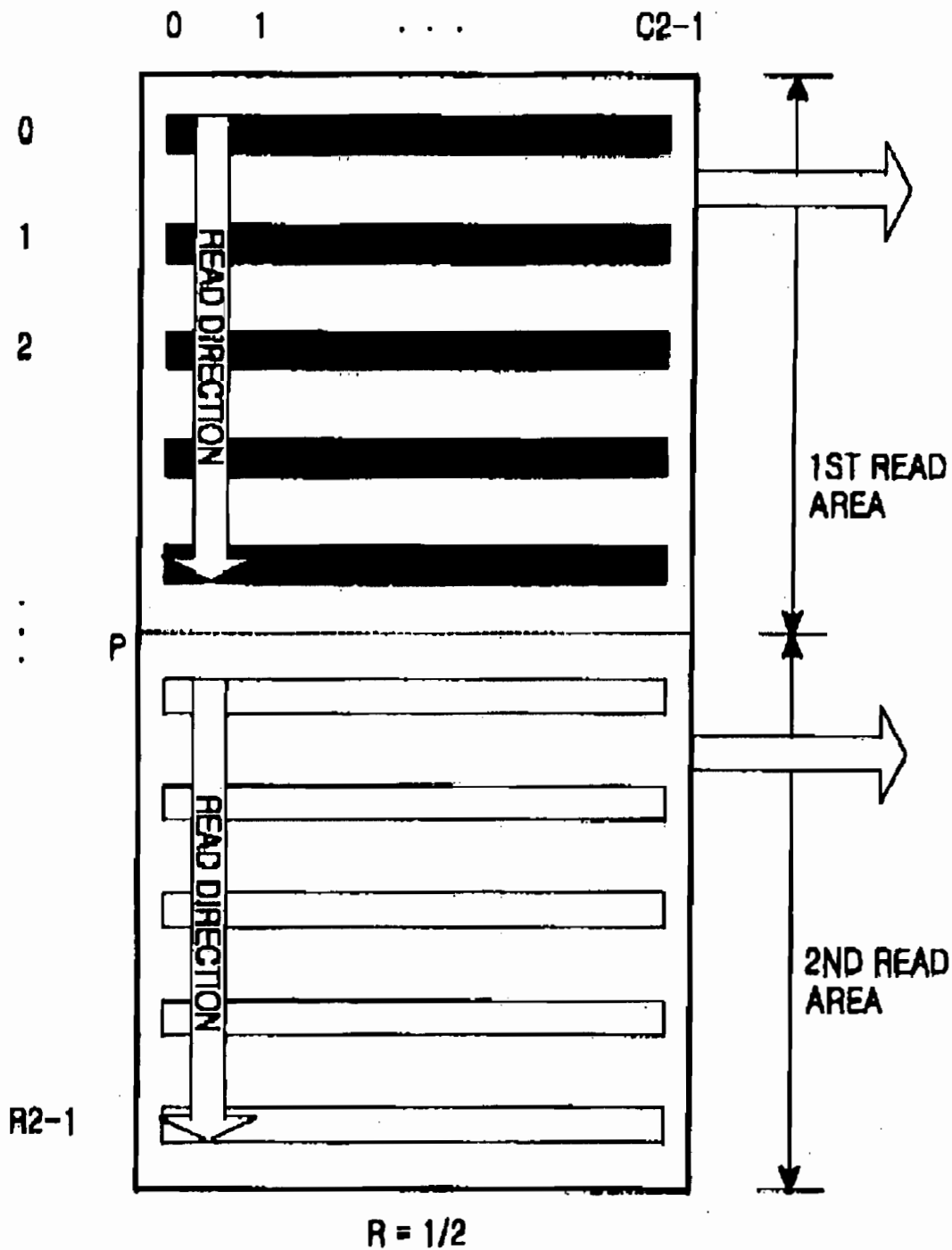
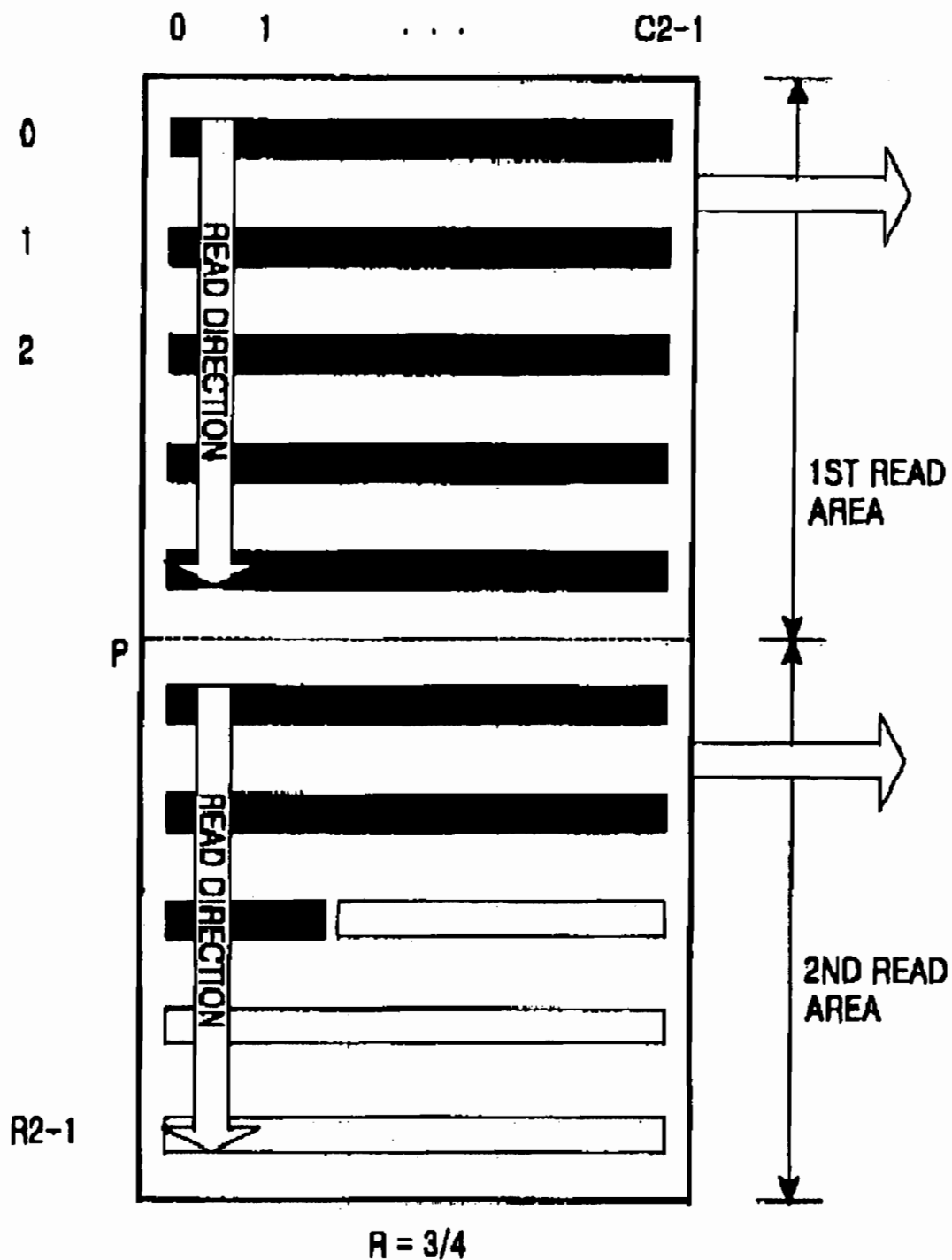


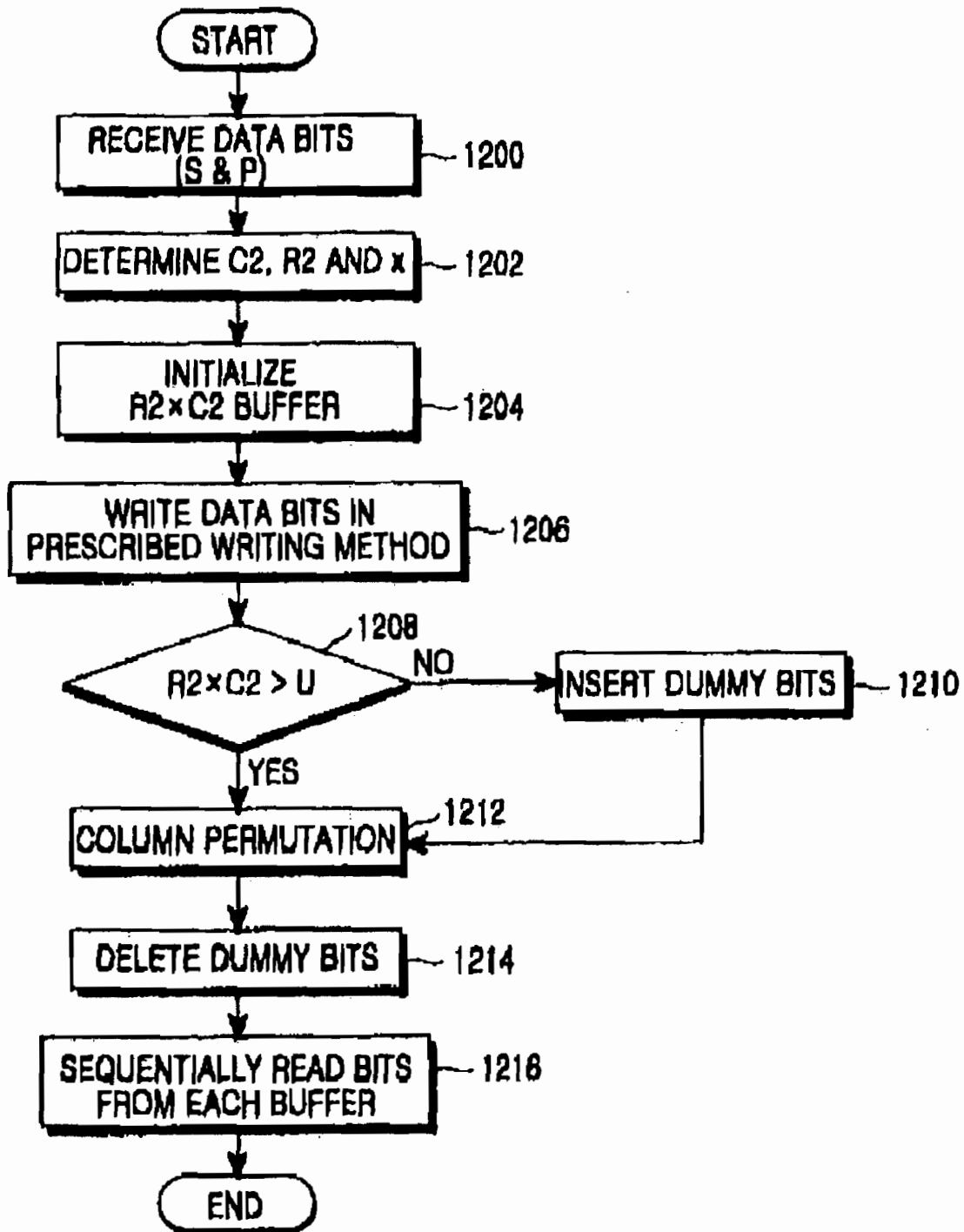
FIG.10D



I .11



I .11



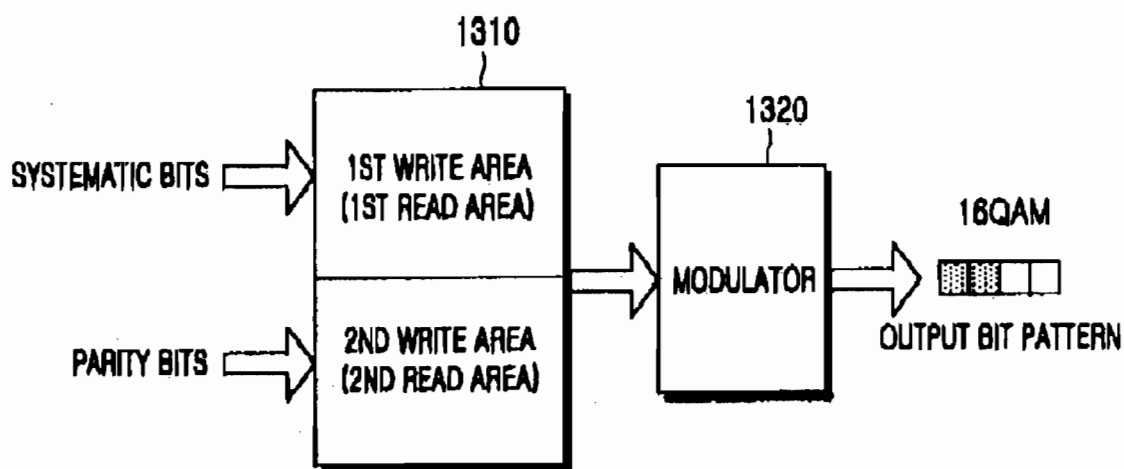


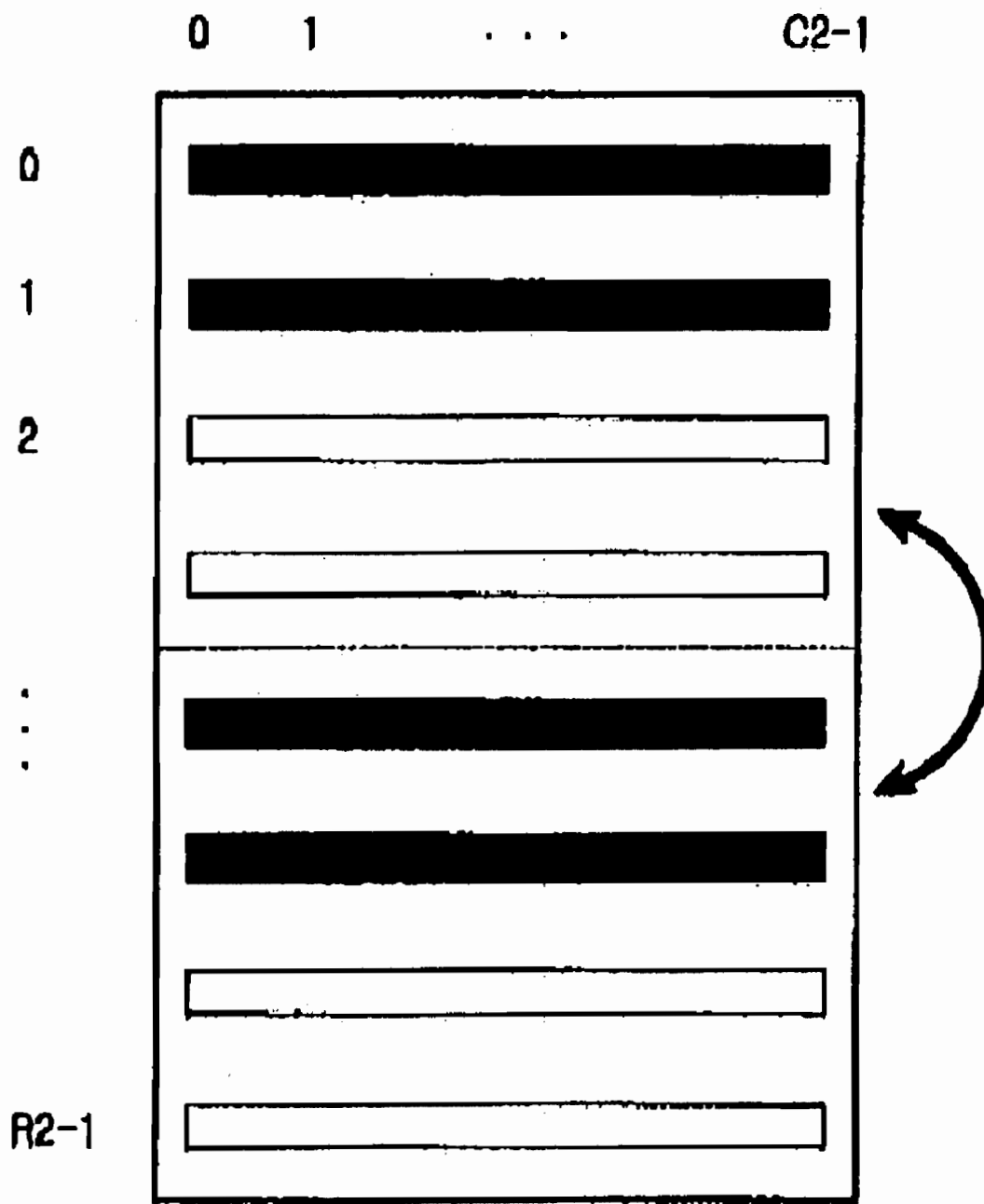
FIG. 13

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