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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)

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

European Search Report dated Apr. 29, 2003, issued in a counterpart application, namely, Appln. No. 02028629.0.

(Continued)

(21) Appl. No.: **10/324,215**

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

(22) Filed: **Dec. 20, 2002**

(65) **Prior Publication Data**

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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

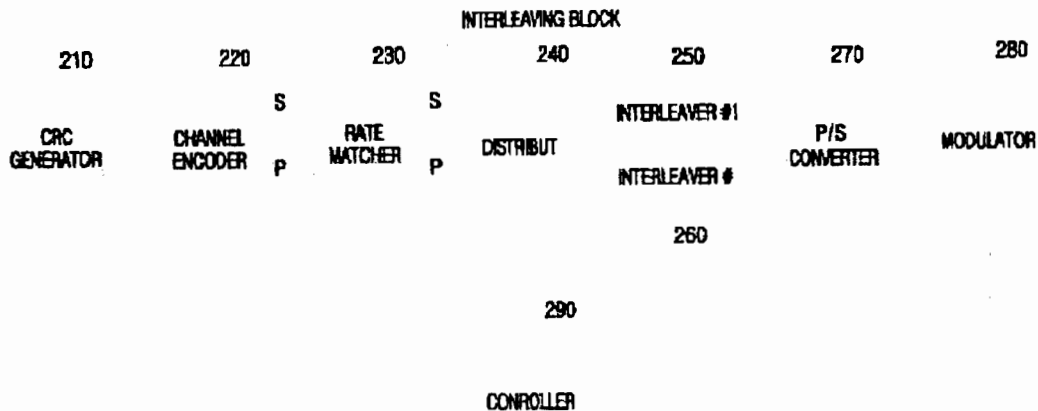
(58) **Field of Classification Search** None
See application file for complete search history.

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16 Claims, 27 Drawing Sheets



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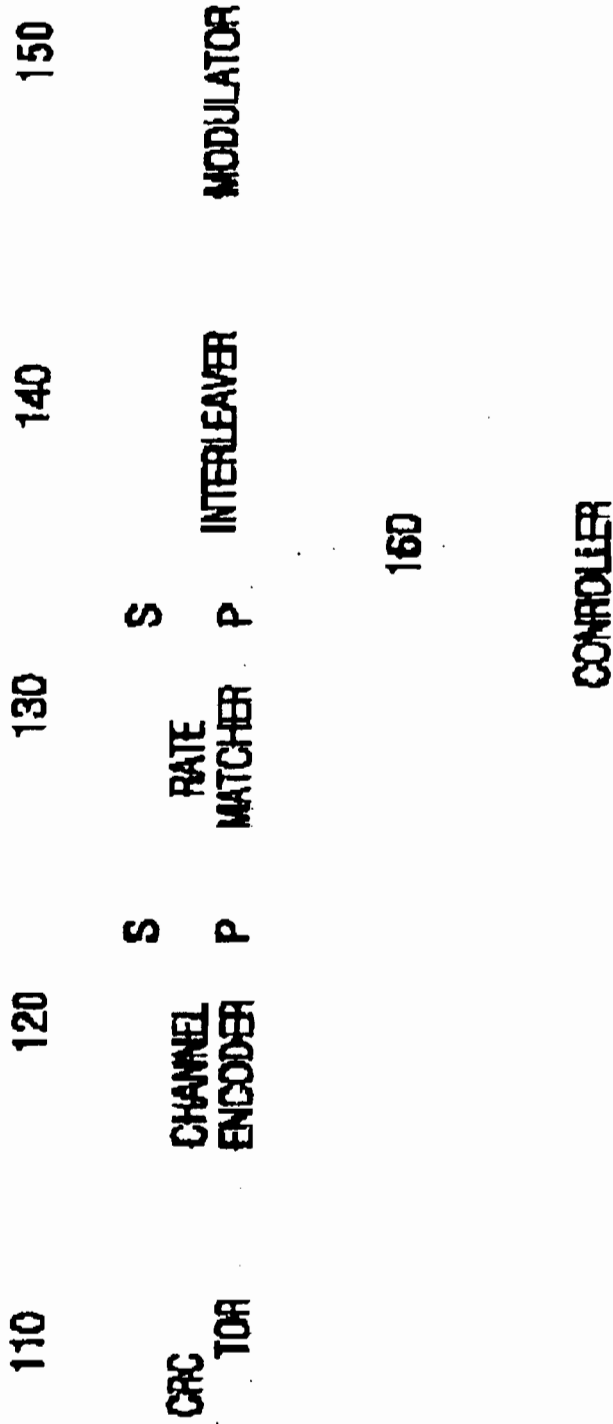


FIG. 1
(PRIOR ART)

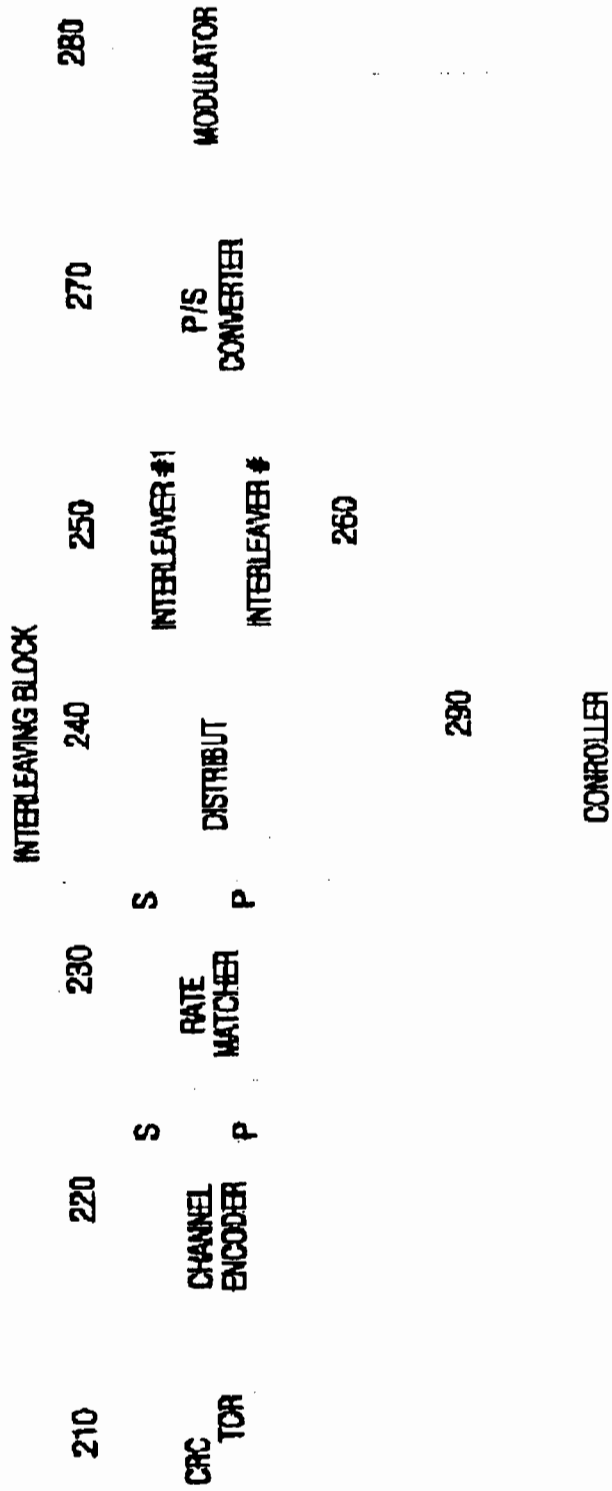


FIG.2

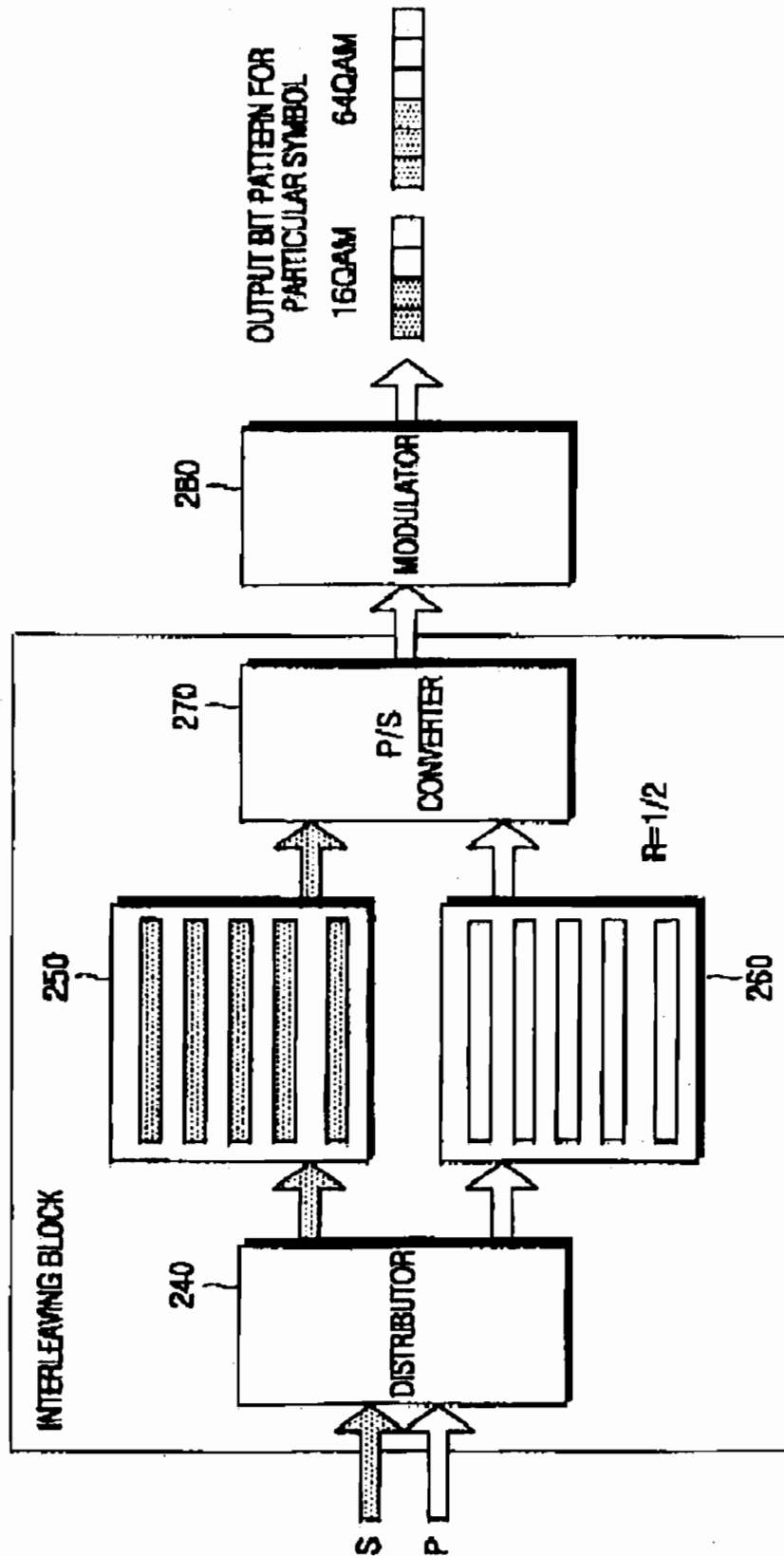


FIG. 3

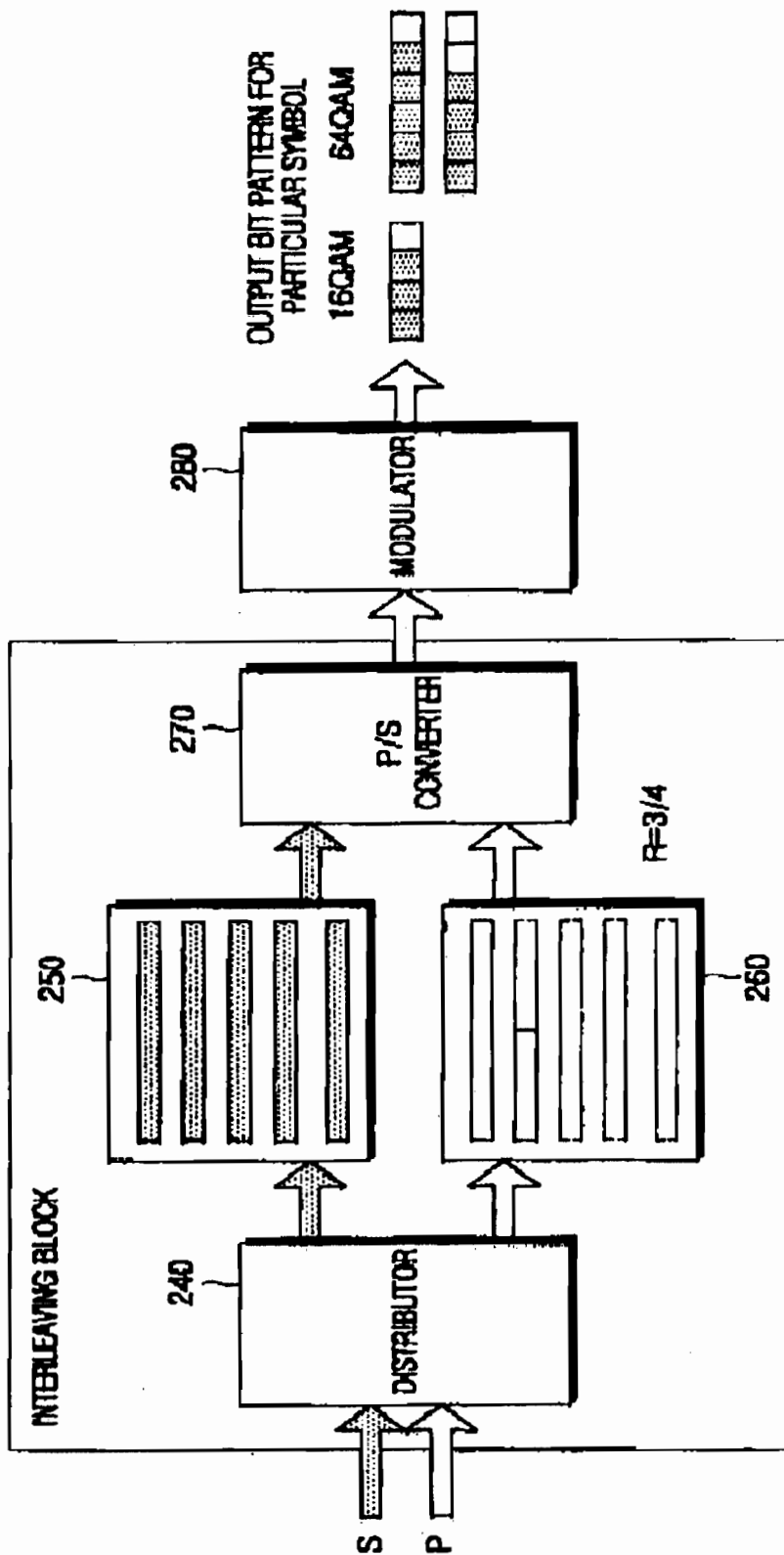


FIG. 4

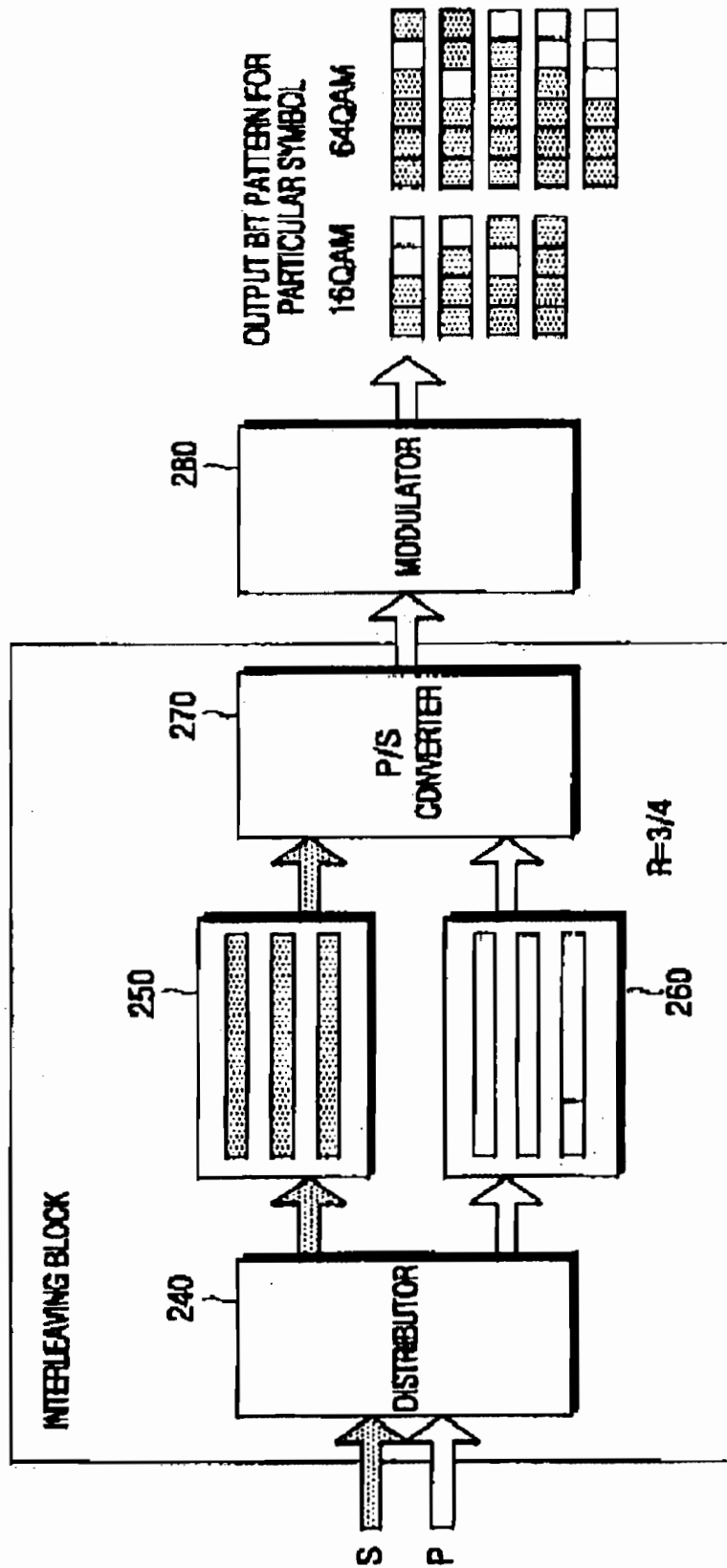


FIG. 5

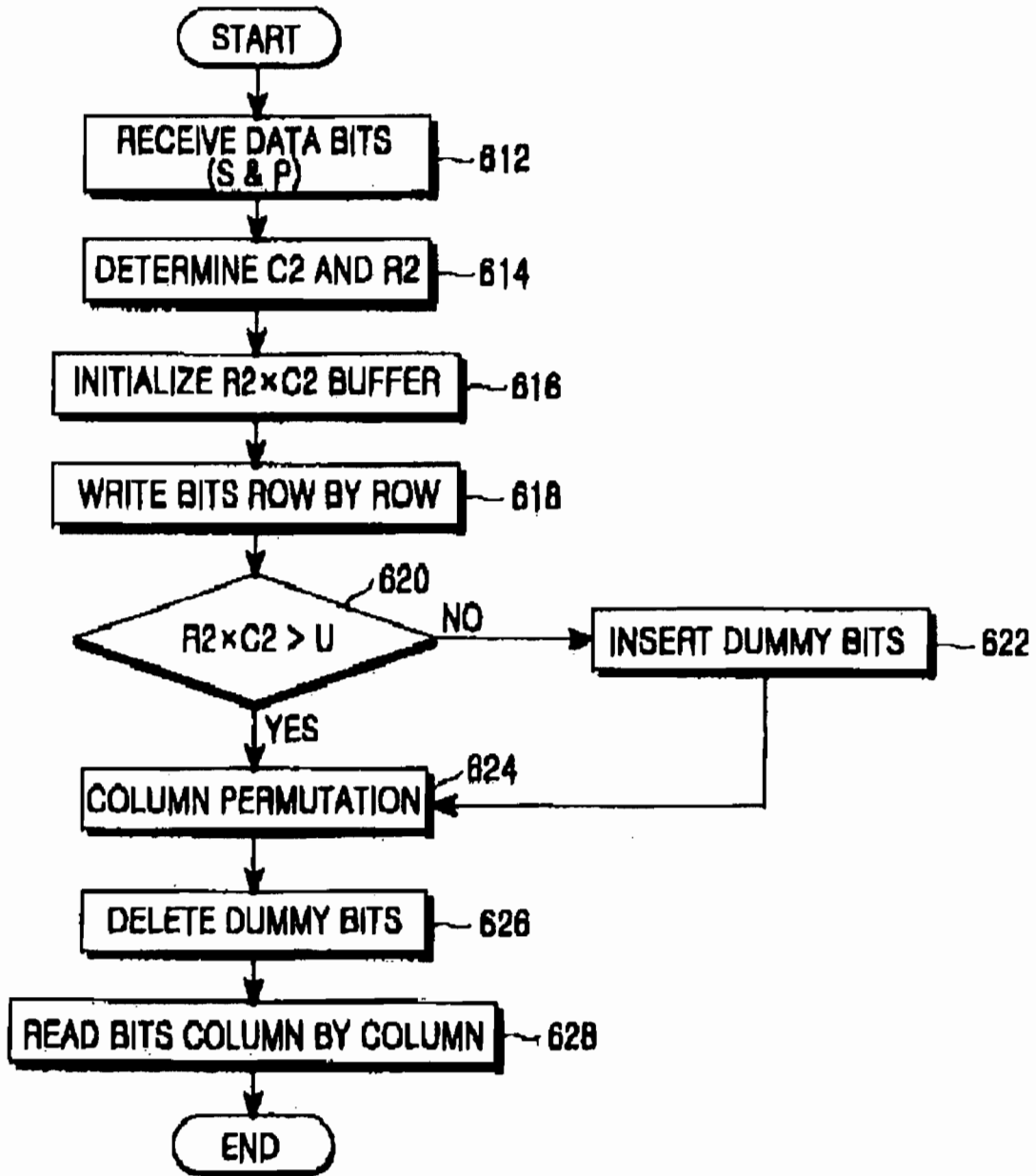


FIG. 6

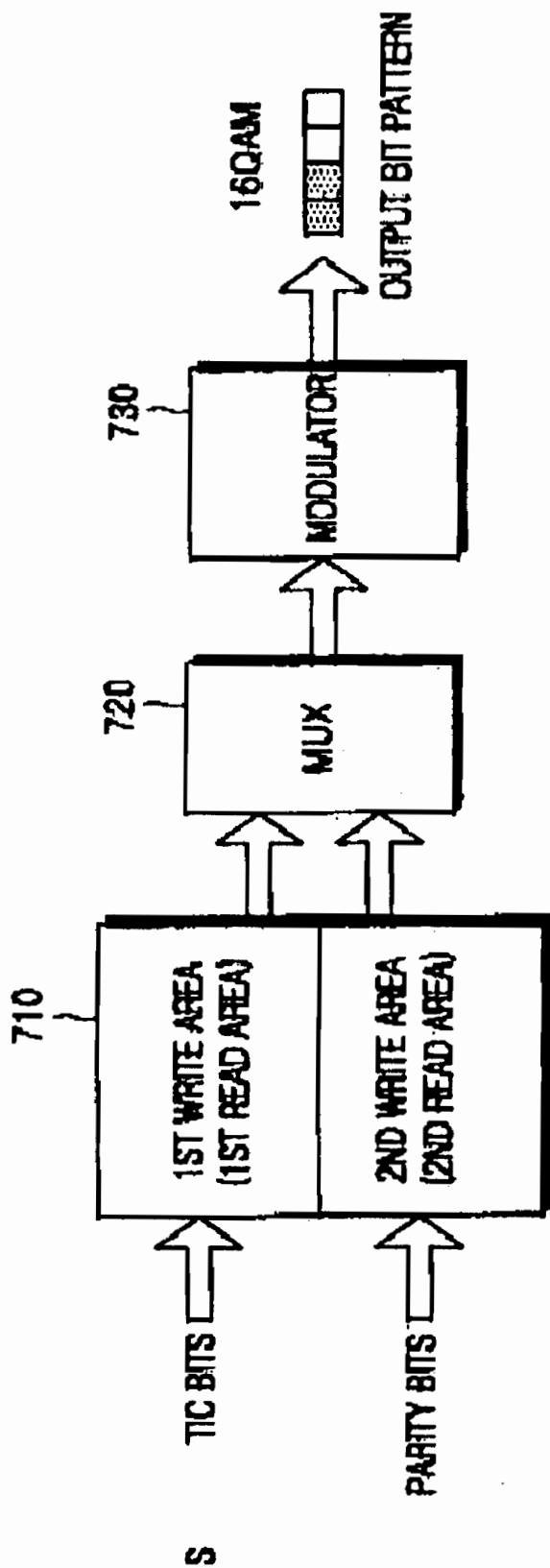
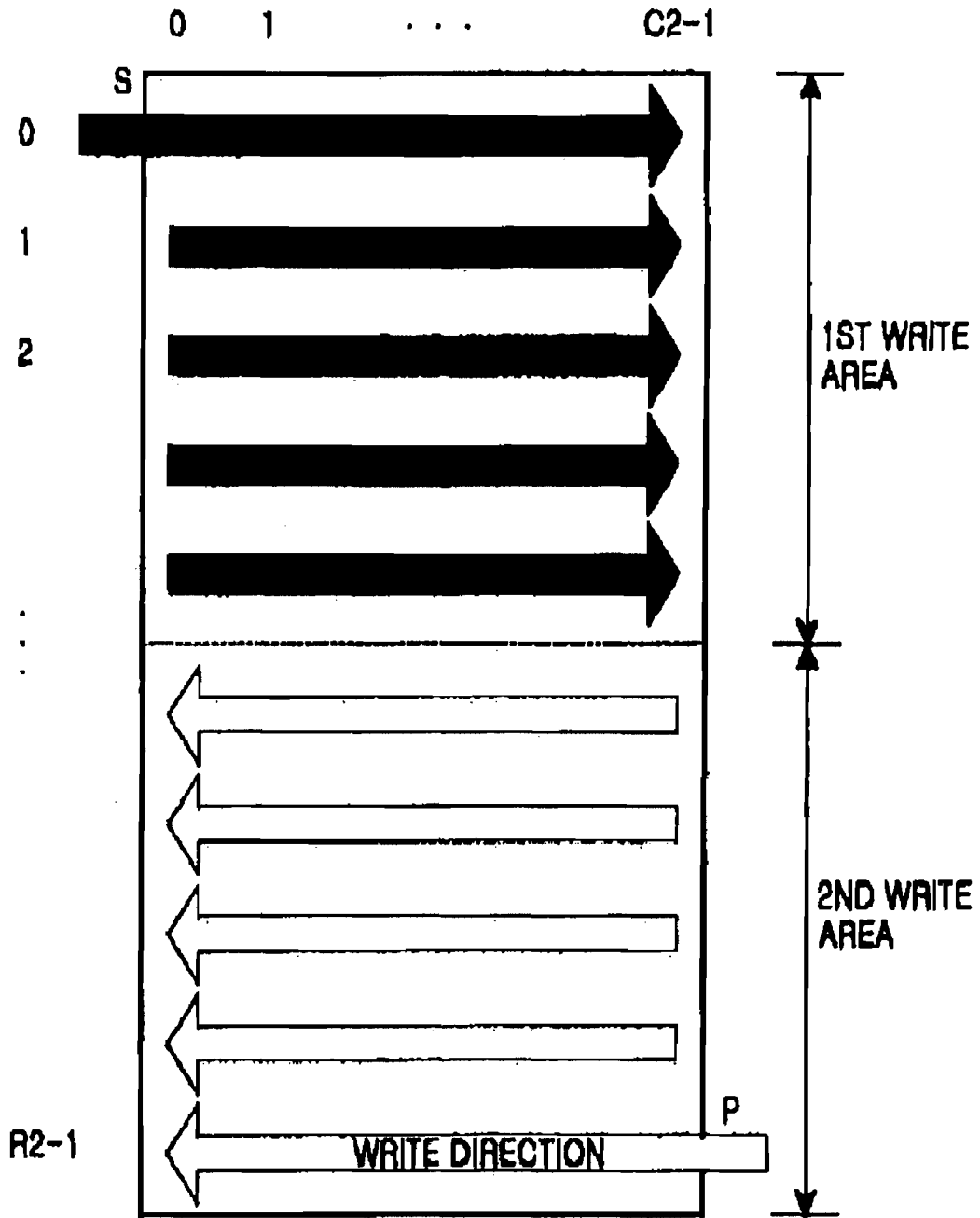
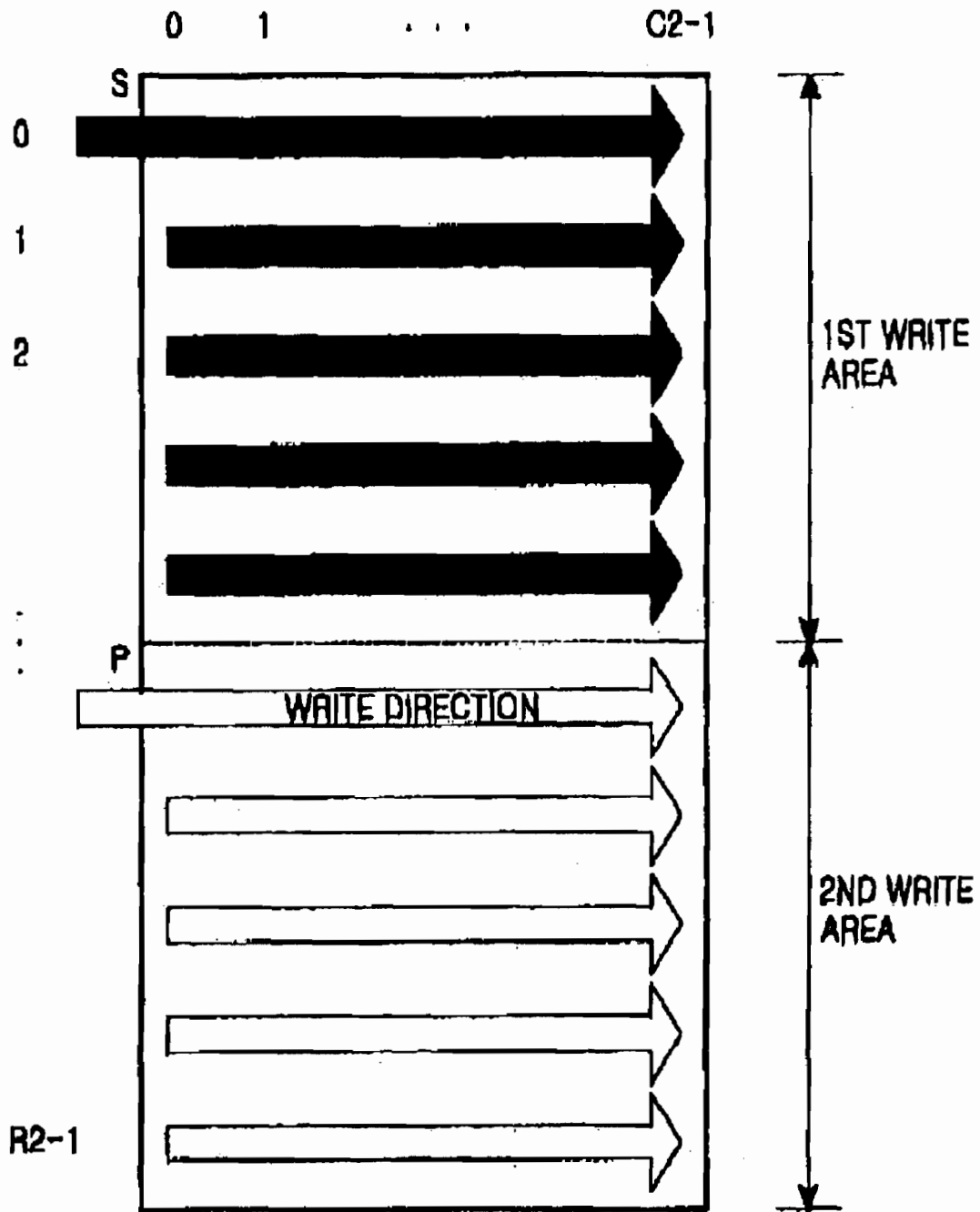


FIG. 7



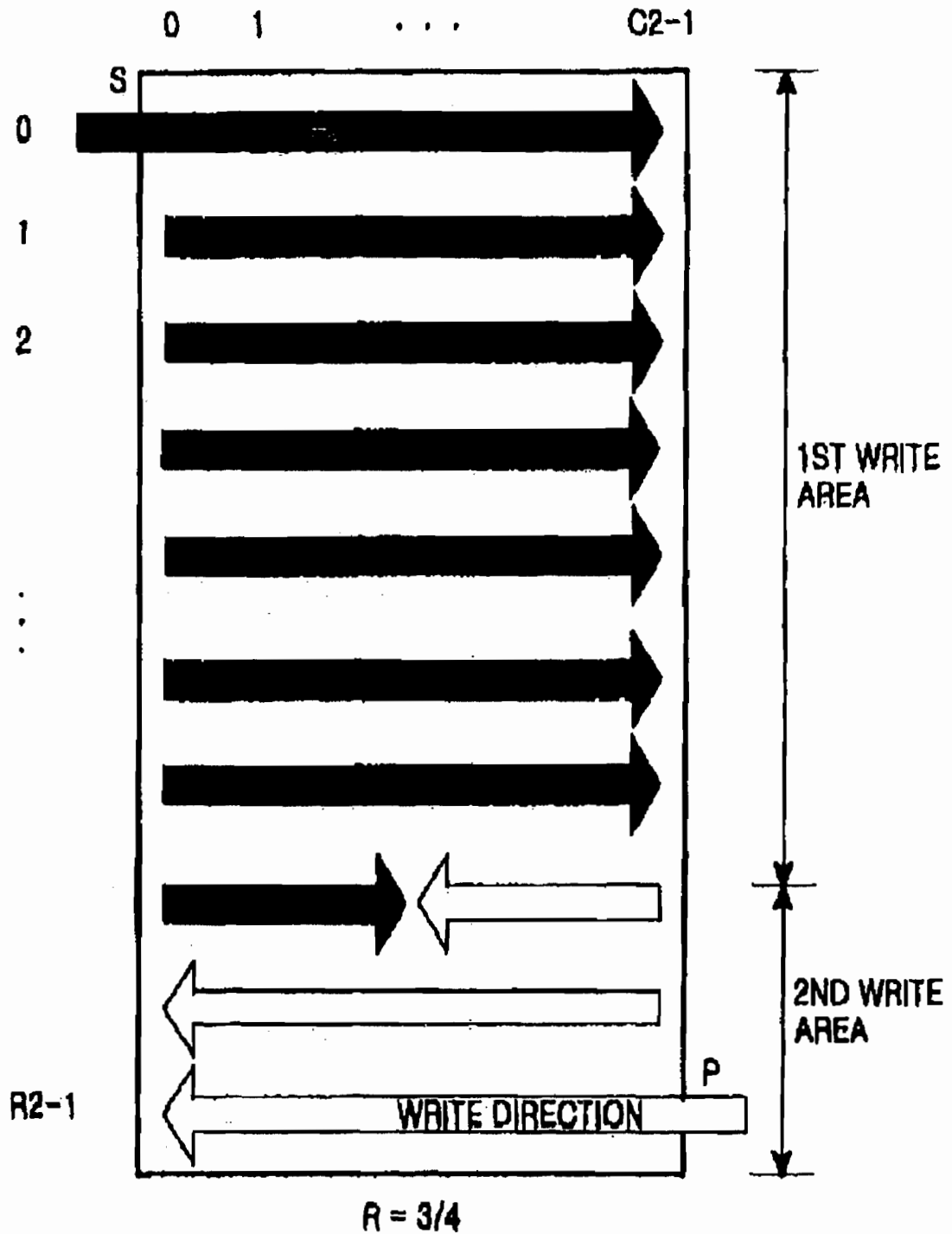
$$R = 1/2$$

I .8



$$R = 1/2$$

I .8



I .

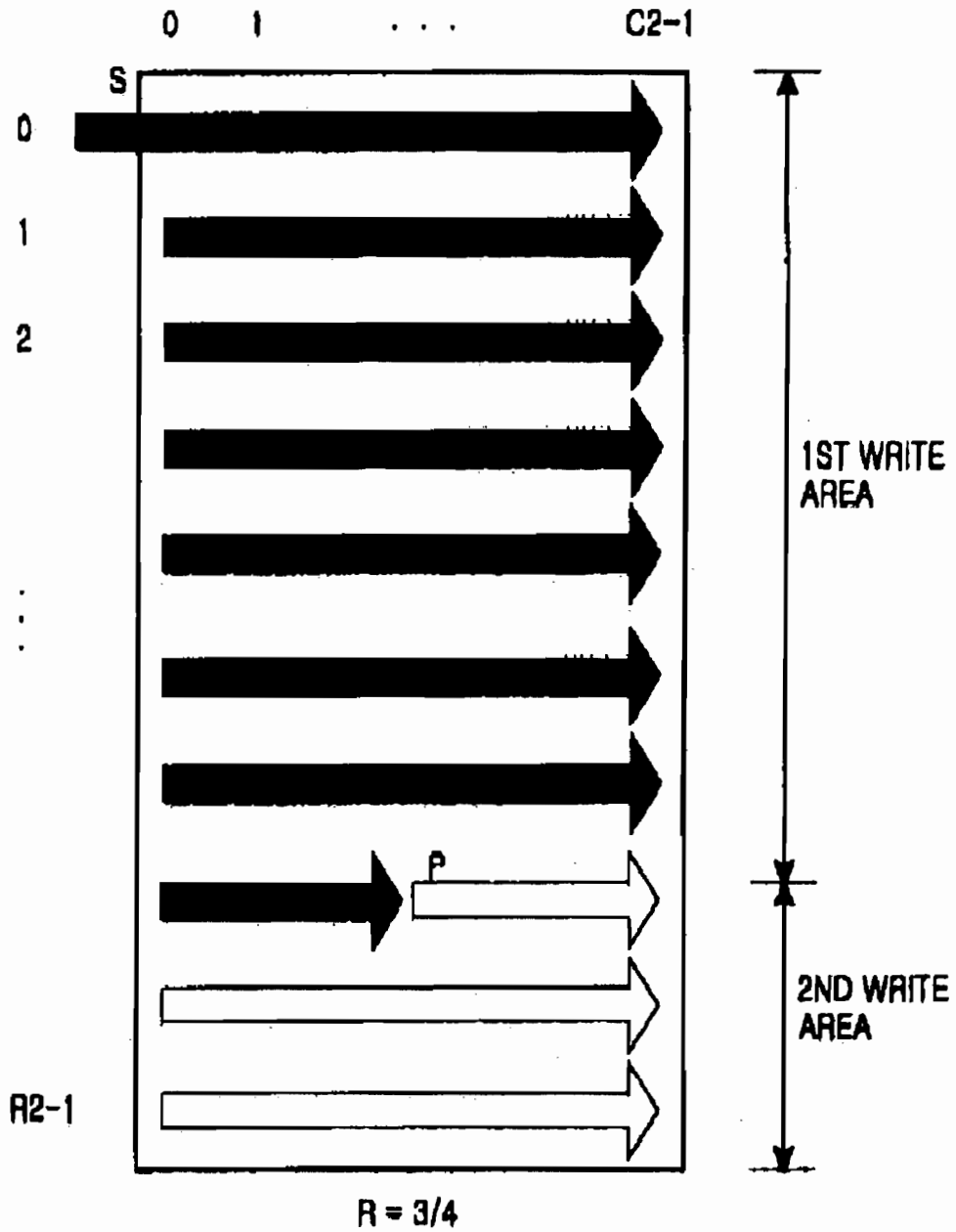
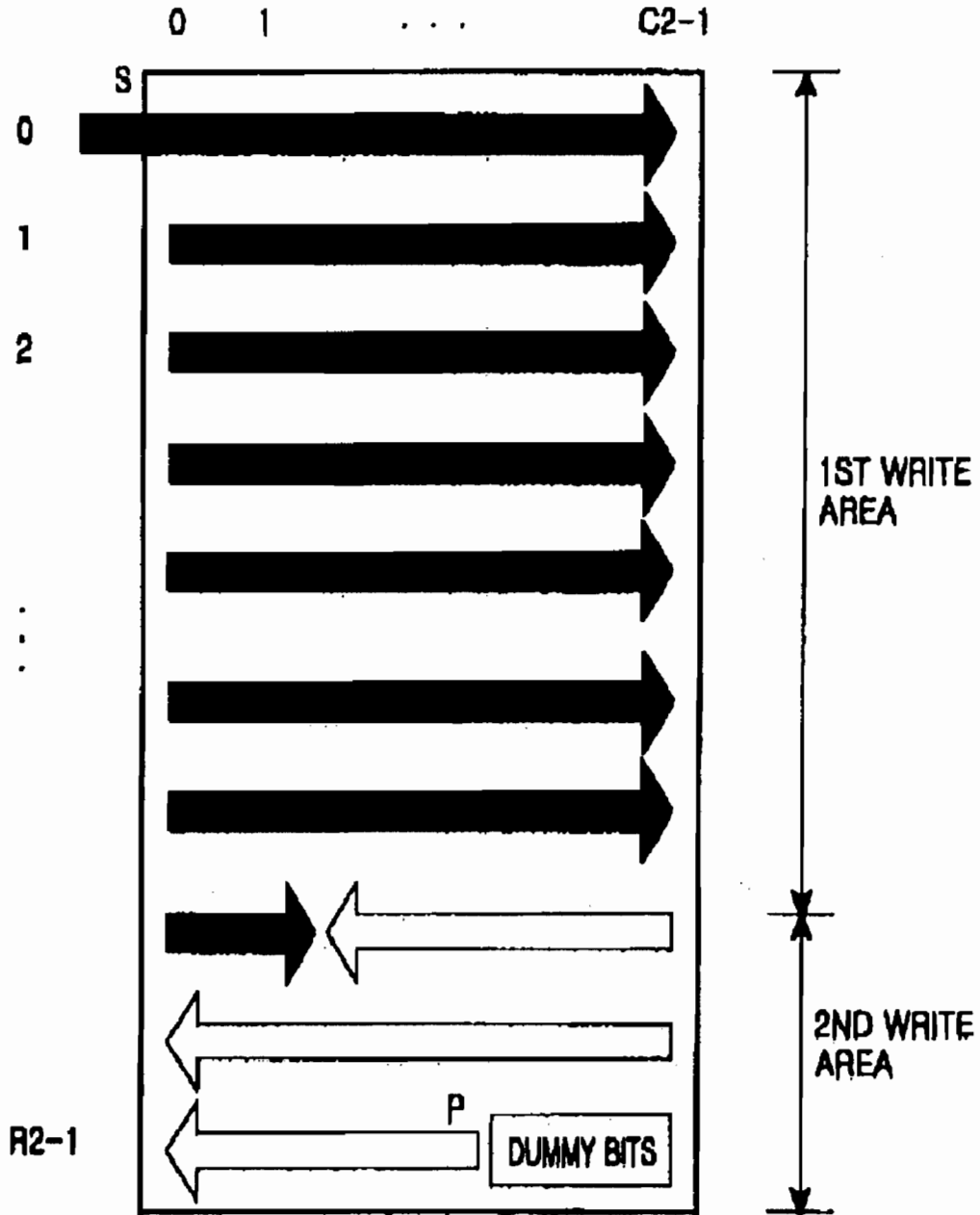
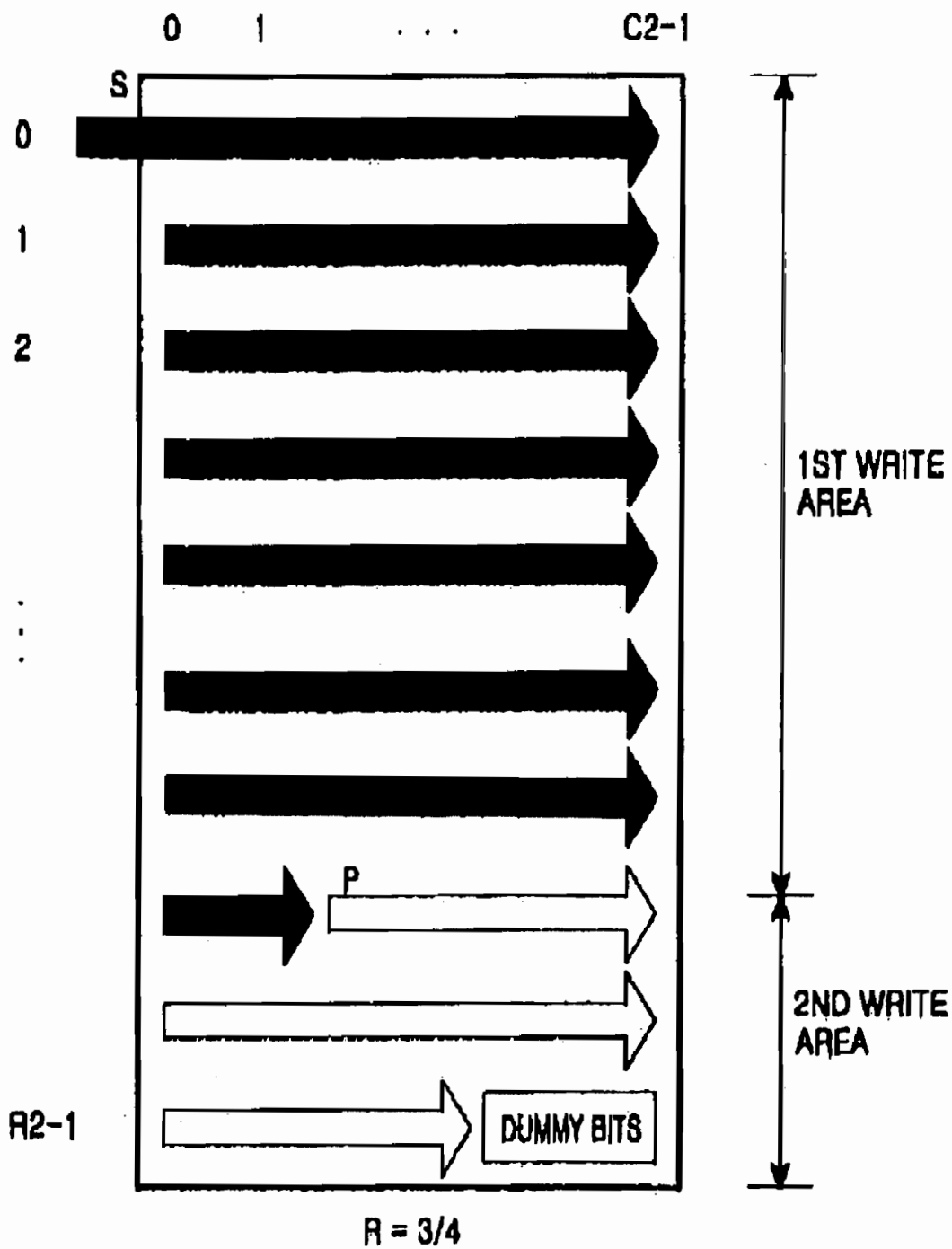


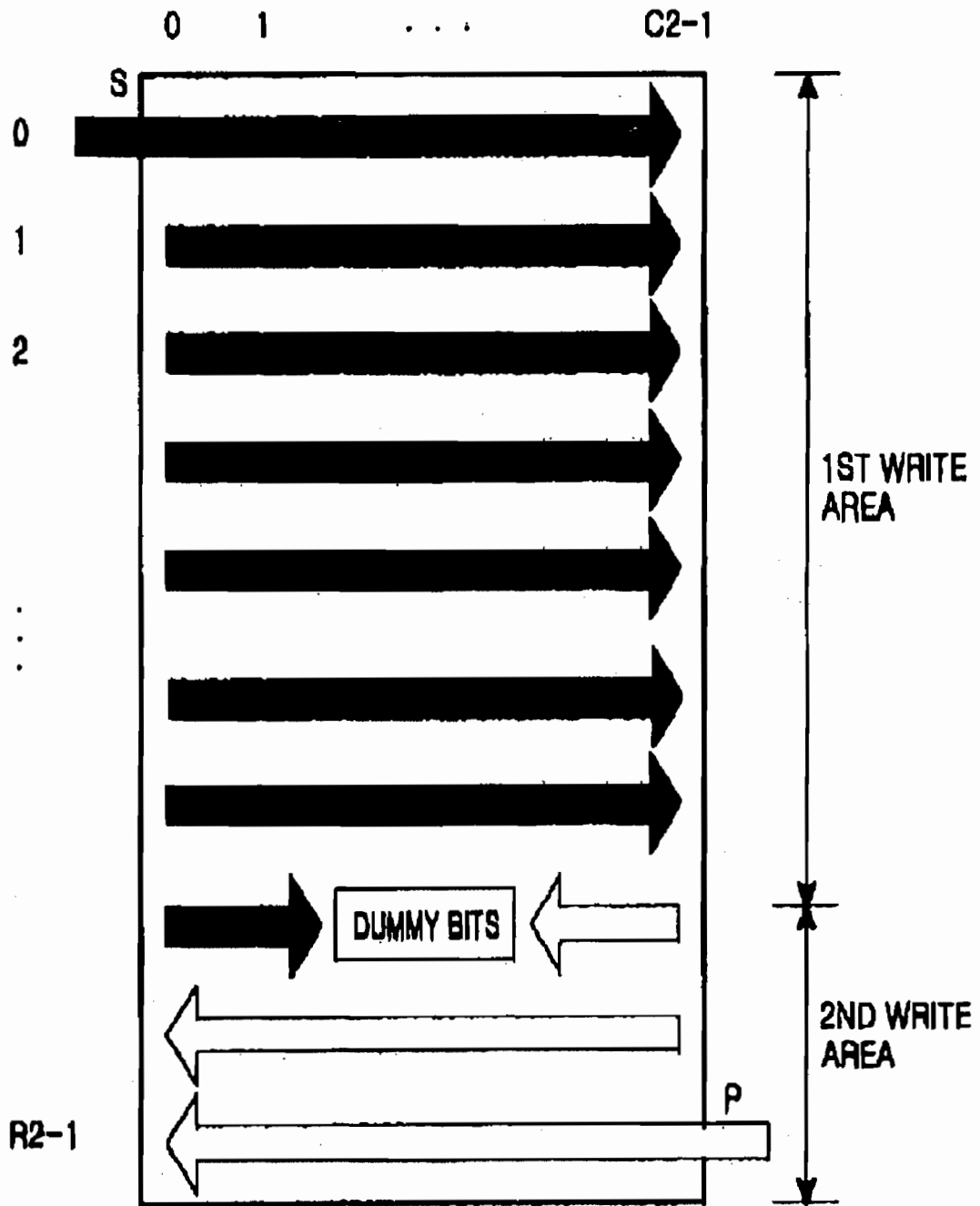
FIG. 9B



I .10



I .10



I .1

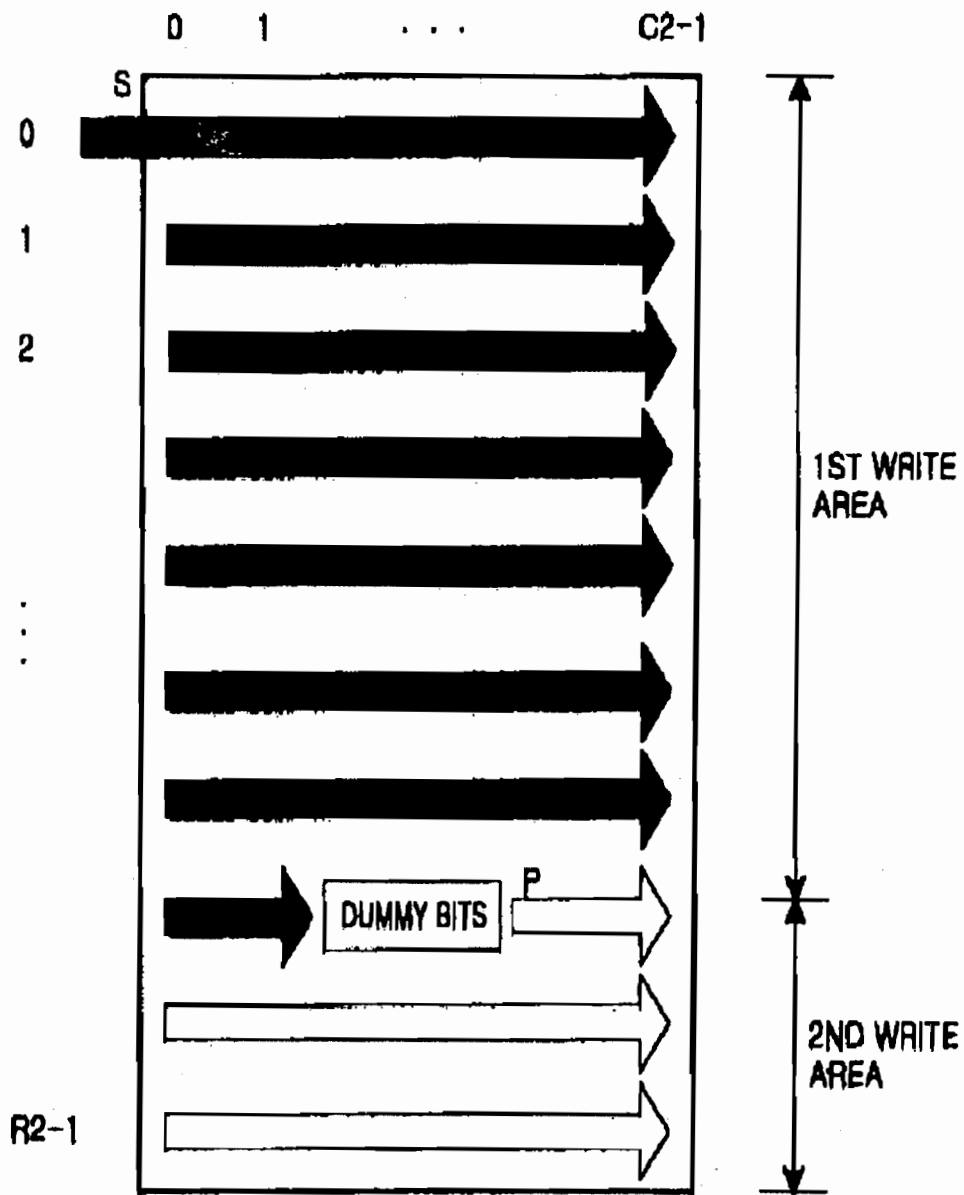
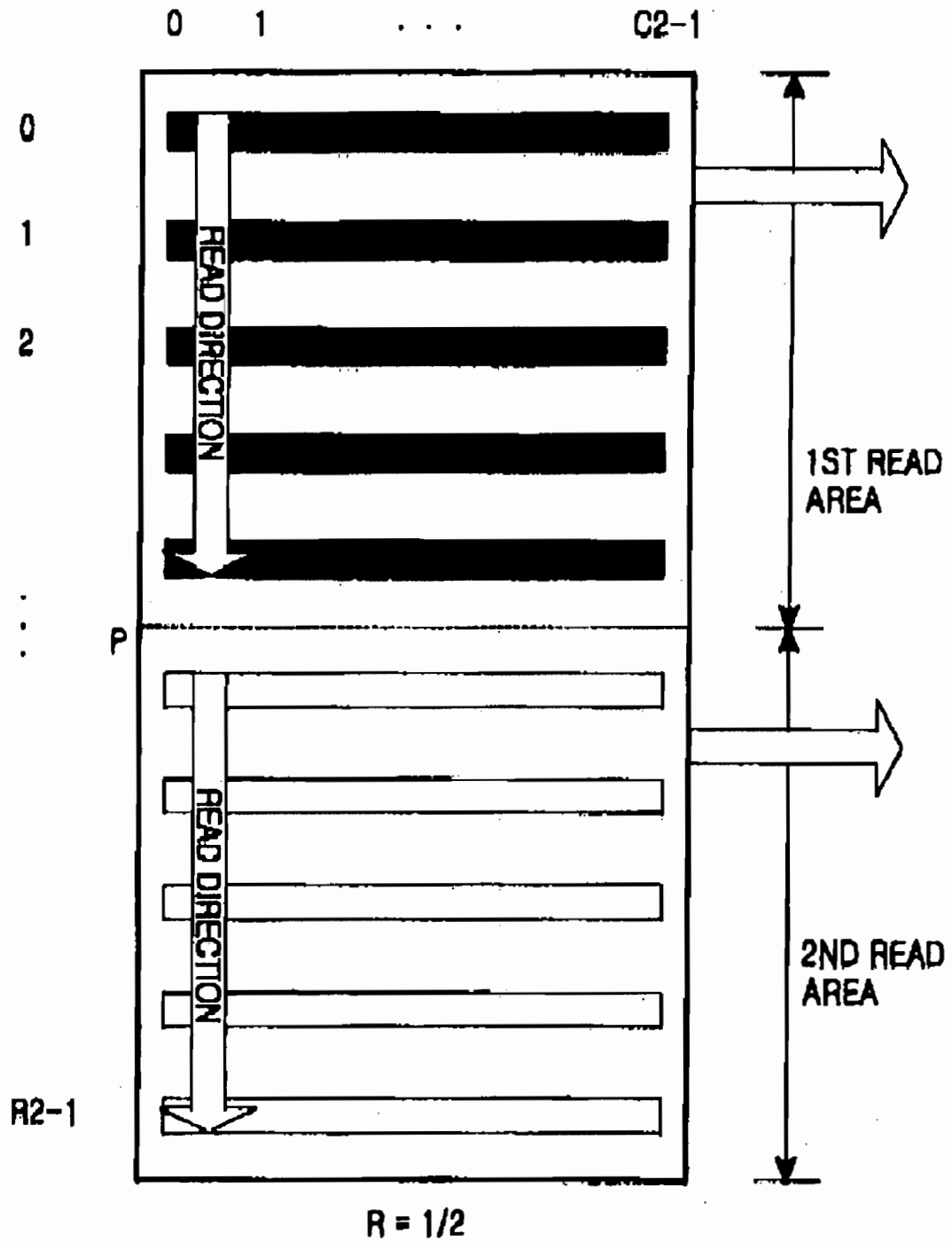
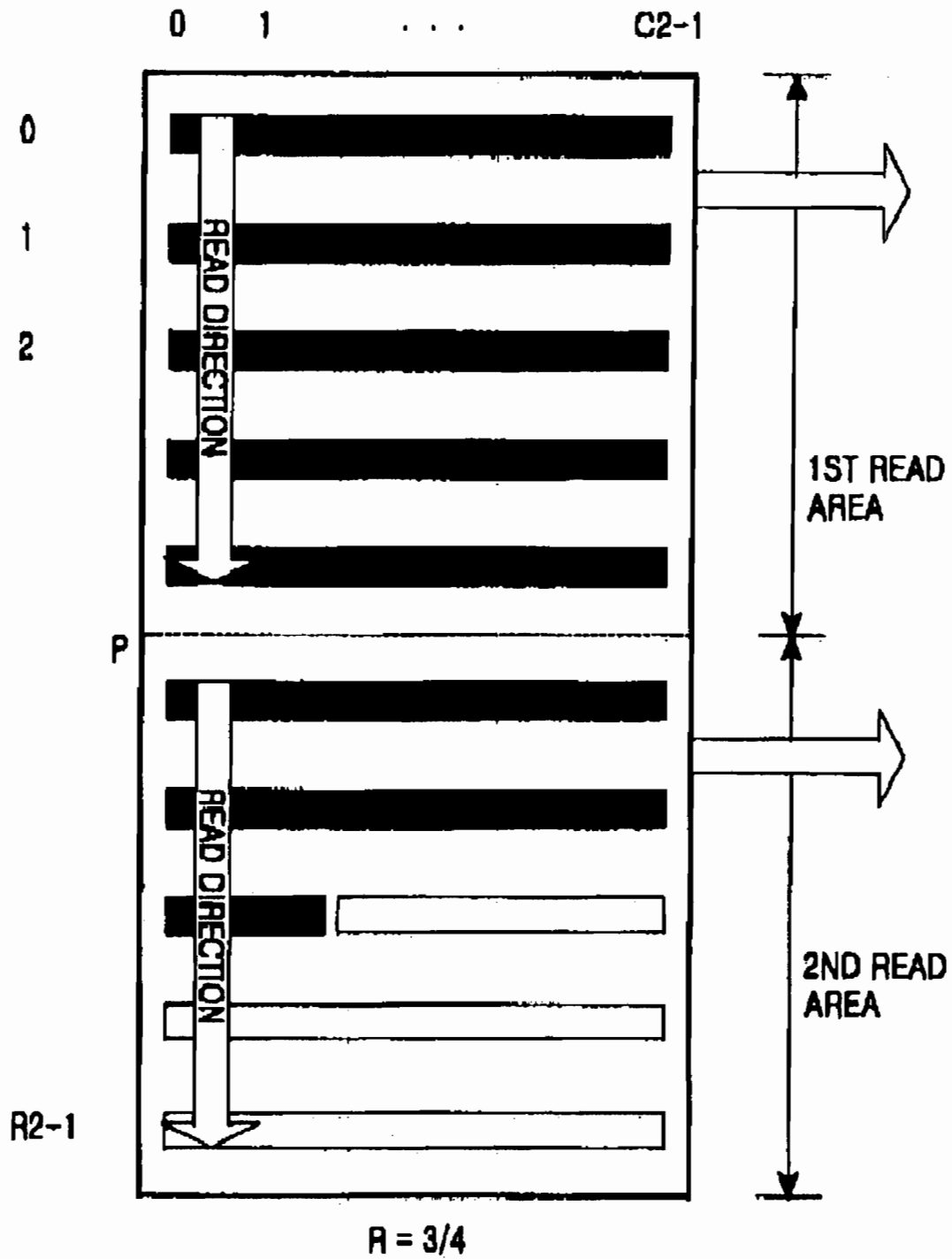


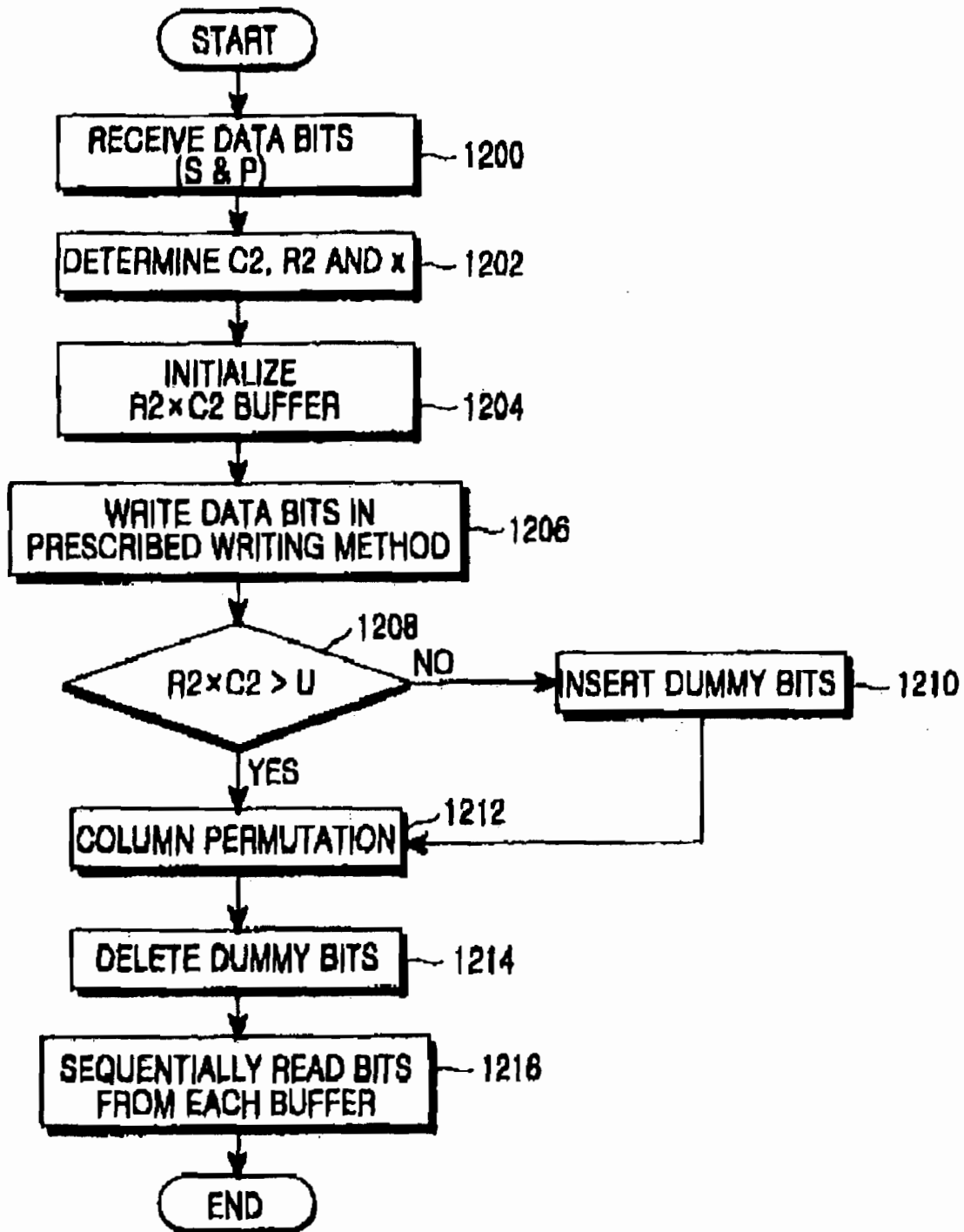
FIG. 10D



I .11



I .11



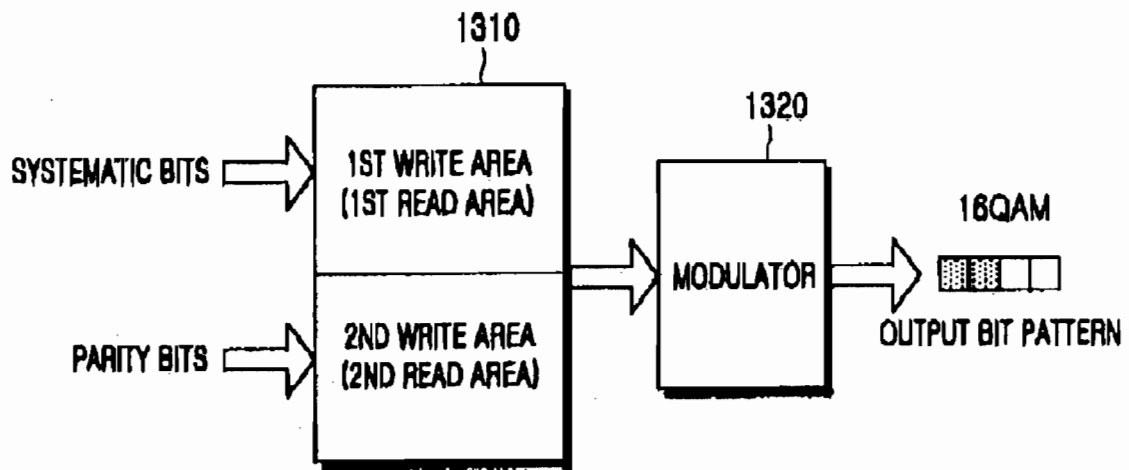
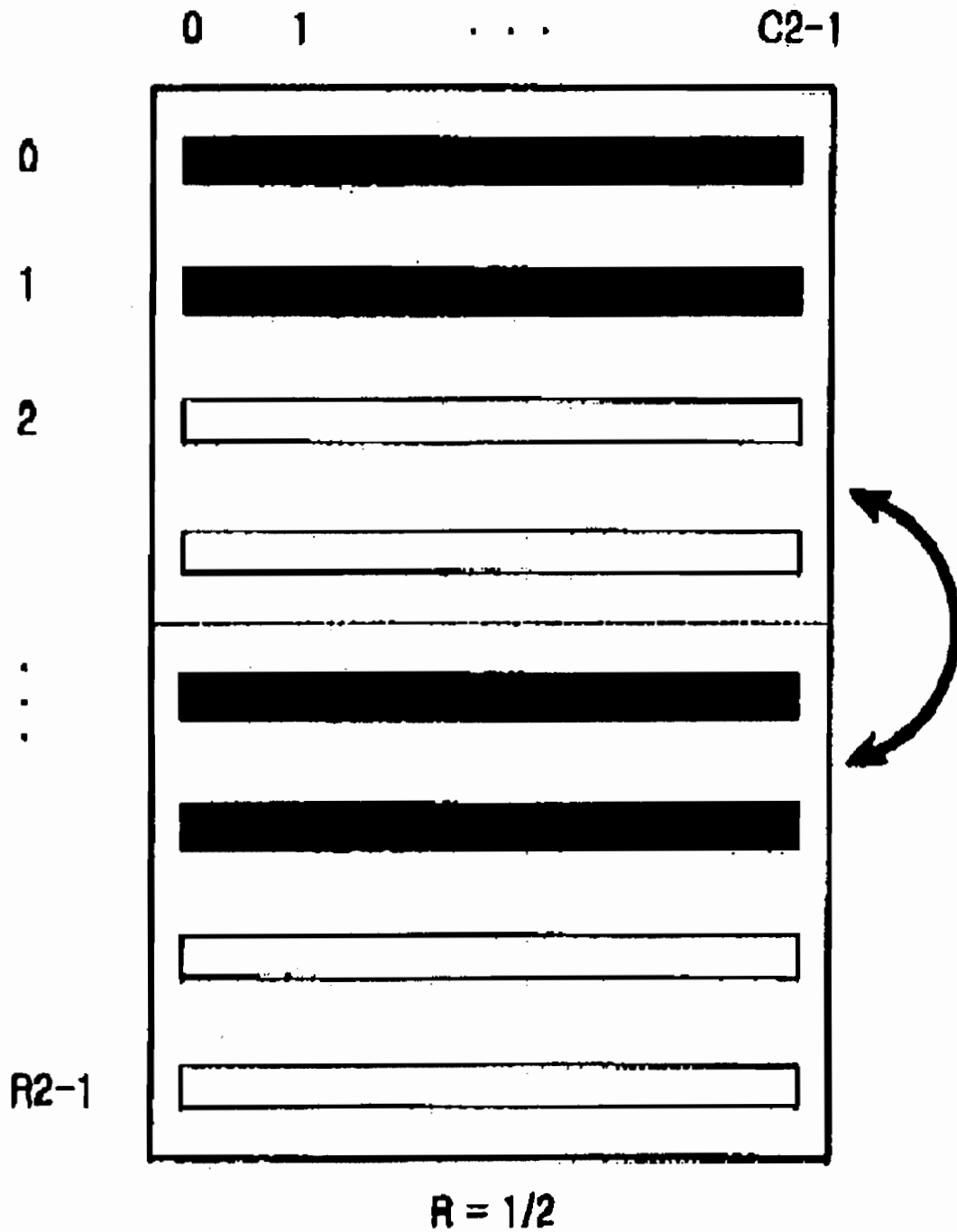
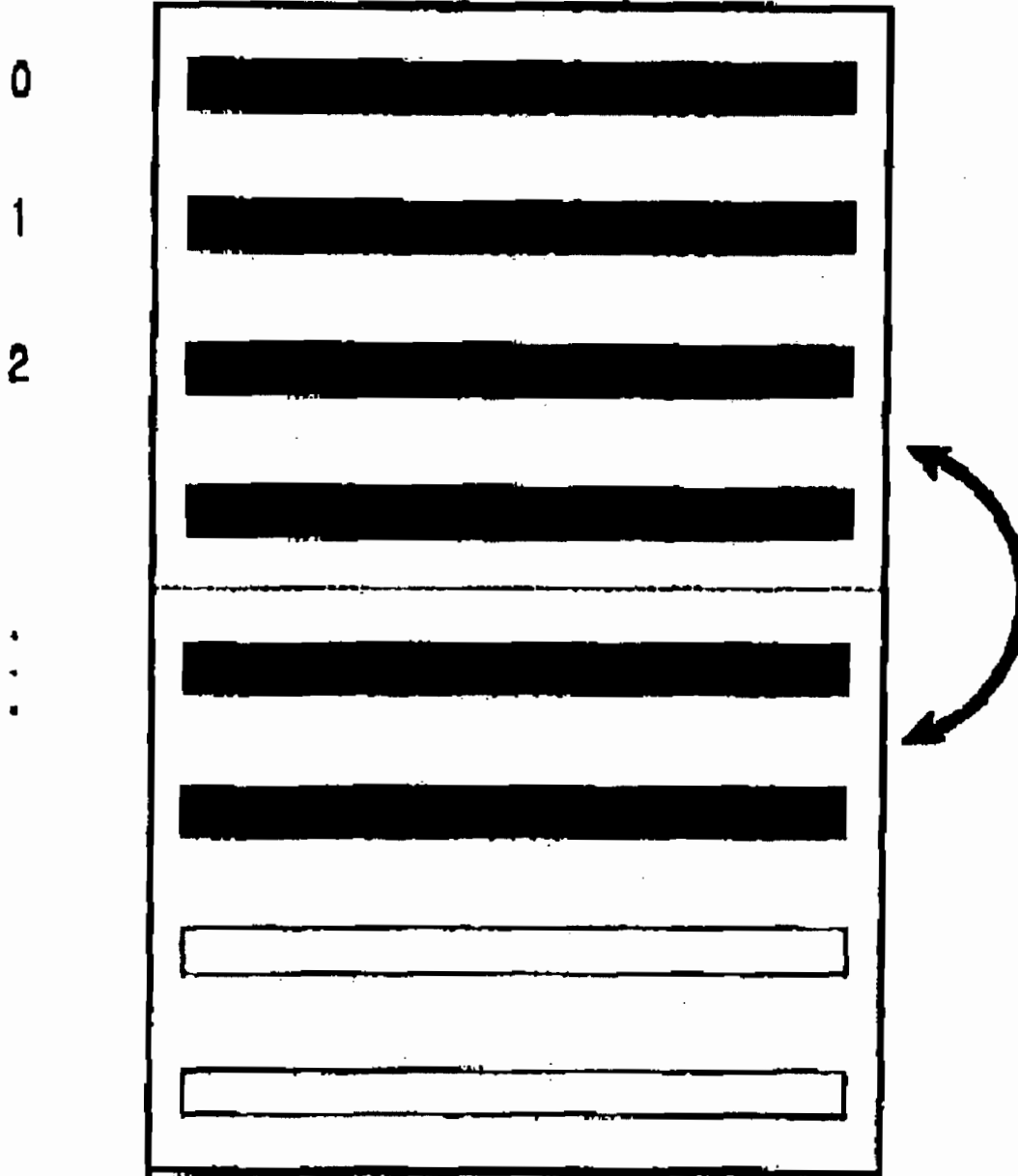


FIG. 13



I .

0 1 . . . C2-1



R2-1

$R = 3/4$