

DEFENSIVE PUBLICATION

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948 O.G. 7

T948,010 DIRECTORY INSERTION AND DELETION METHOD AND MEANS

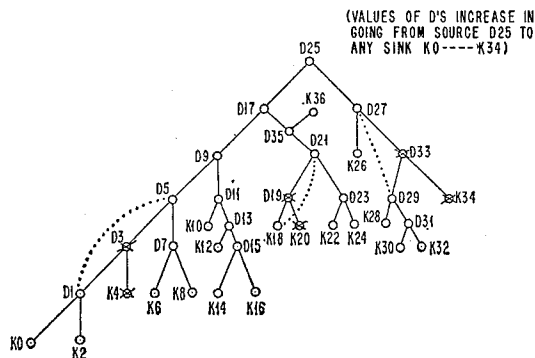
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N.Y.

Continuation of application Ser. No. 411,545, Oct. 31,
1973, which is a continuation of application Ser. No.
136,951, Apr. 23, 1971. This application Apr. 10, 1975,
Ser. No. 566,892

Int. Cl. G06F 7/00

U.S. Cl. 444-1

27 Sheets Drawing. 187 Pages of Specification



An electrical method for generating and maintaining an electrical directory entity in a data processing machine. The directory may be used to automatically locate objects in the computer system, e.g. in main store or on I/O devices. The objects are represented by electrical identifier signals received as input to the method. Electrical signals are generated comprising connected inner vertices and sinks. The signals comprising each inner vertex from a bit-index field, a flag field, and a connecting edge field. The inner vertices are connected in ascending order along a path in the tree structure by the electrical signals forming the edge fields of the inner vertices in the connected paths. The physical configurations of the electrical identifier signals are used as search arguments for insertions or deletion in a connected path when it is traced. The physical layout of the vertices permits total flexibility by allowing each next vertex in a connected path to be physically located anywhere in the directory entity. Each vertex other than the source is located in one of a pair of cells. Each edge field connects its vertex to two other vertices in a pair of cells. The edge fields may be in absolute, offset, or invertible form, each form having different advantages when using the invention, e.g. the invertible edge permits backward tracing along a connected path.

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L. J. WOODRUM
DIRECTORY INSERTION AND DELETION
METHOD AND MEANS

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Original Filed April 10, 1975

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FIG. 1A

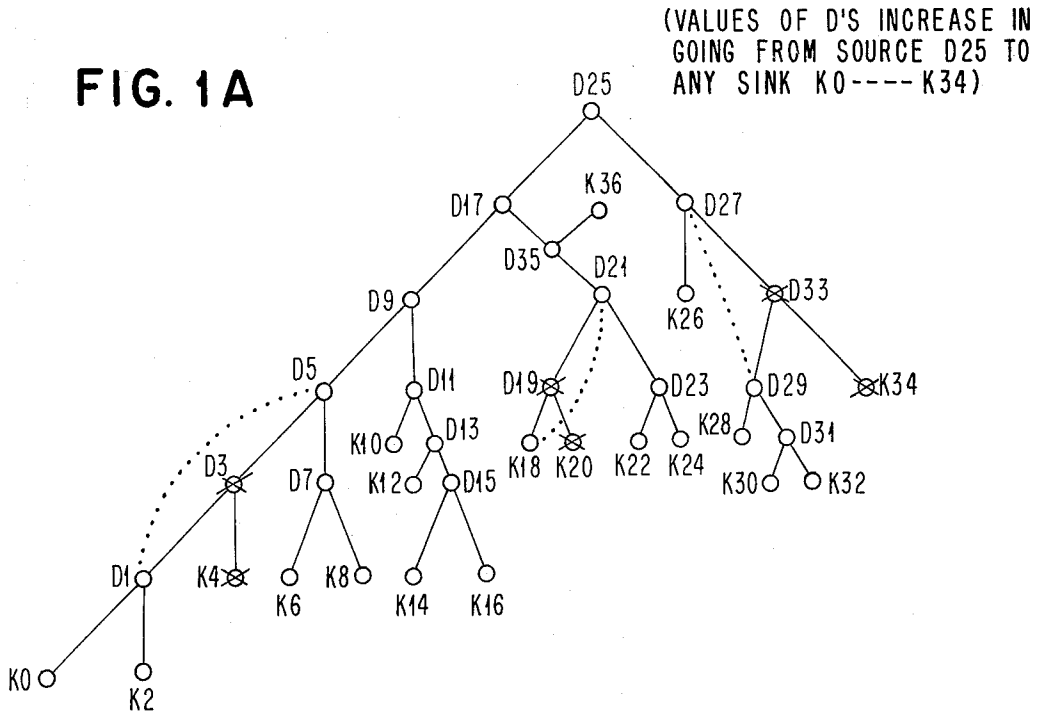


FIG. 1B

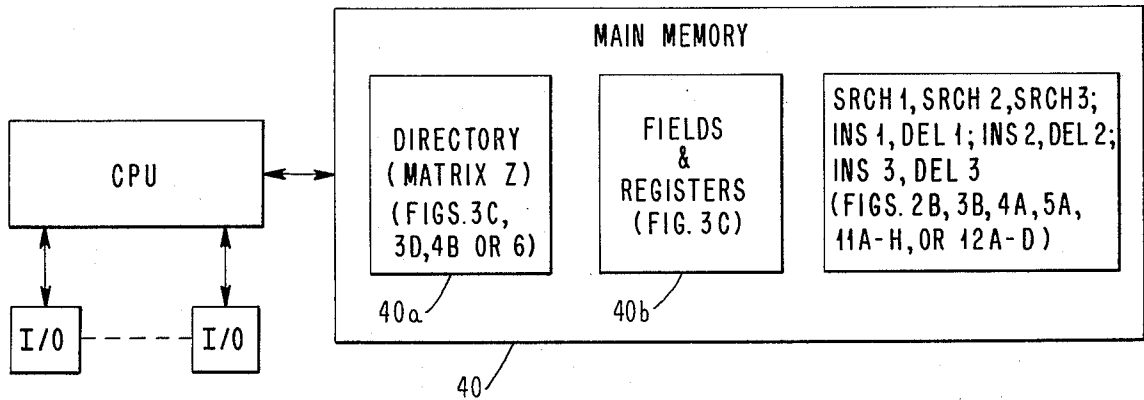
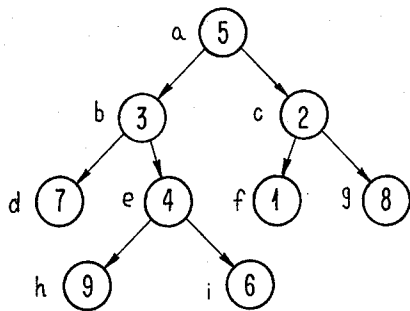


FIG. 0

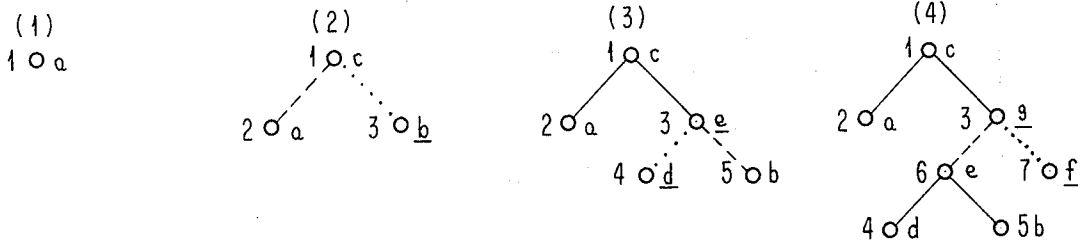


INVENTOR
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BY *Bernard M. Goldman*

ATTORNEY

FIG. 2A INSERTION

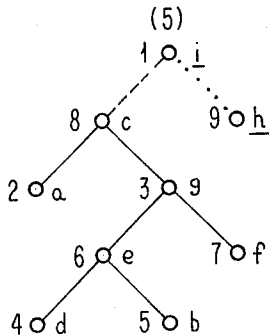


<u>a</u>

1	c
2	a
3	<u>b</u>

1	c
2	a
3	<u>e</u>
4	<u>d</u>
5	<u>b</u>

1	c
2	a
3	<u>g</u>
4	<u>d</u>
5	b
6	e
7	<u>f</u>



1	<u>i</u>
2	a
3	<u>g</u>
4	<u>d</u>
5	b
6	e
7	f
8	c
9	<u>h</u>

LEGEND

- VERTEX
- PRIOR INSERTED EDGE BETWEEN PRIOR VERTICES.
- - -○ NEW EDGE FROM NEW VERTEX TO DISPLACED VERTEX.
-○ NEW EDGE FROM NEW VERTEX TO NEW SINK.
- c UNDERLINE INDICATES NEW VERTEX.
- c NO UNDERLINE INDICATES EXISTING VERTEX.

┌───┐ NEW ENTRY IN DIRECTORY.

└───┘ OLD ENTRY IN DIRECTORY

a,b,c,ETC. REPRESENT ORDER OF INSERTION

1,2,3, ETC. ARE INDICES OF DIRECTORY ROW REPRESENTING THE VERTICES.

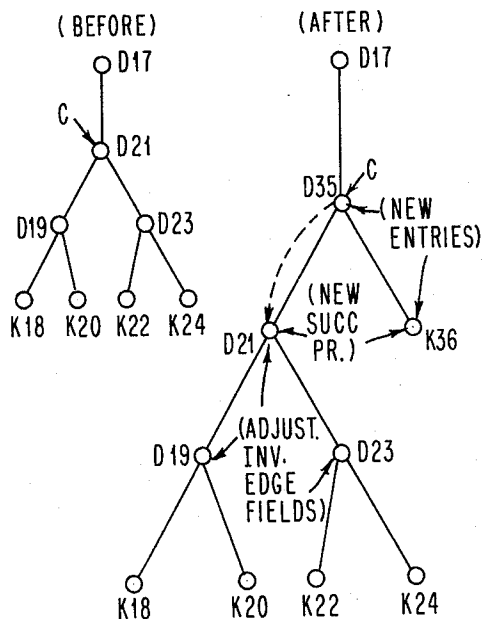


FIG. 2C

FIG. 2B

INSERTION WITH ABSOLUTE
 EDGE REPRESENTATIONS

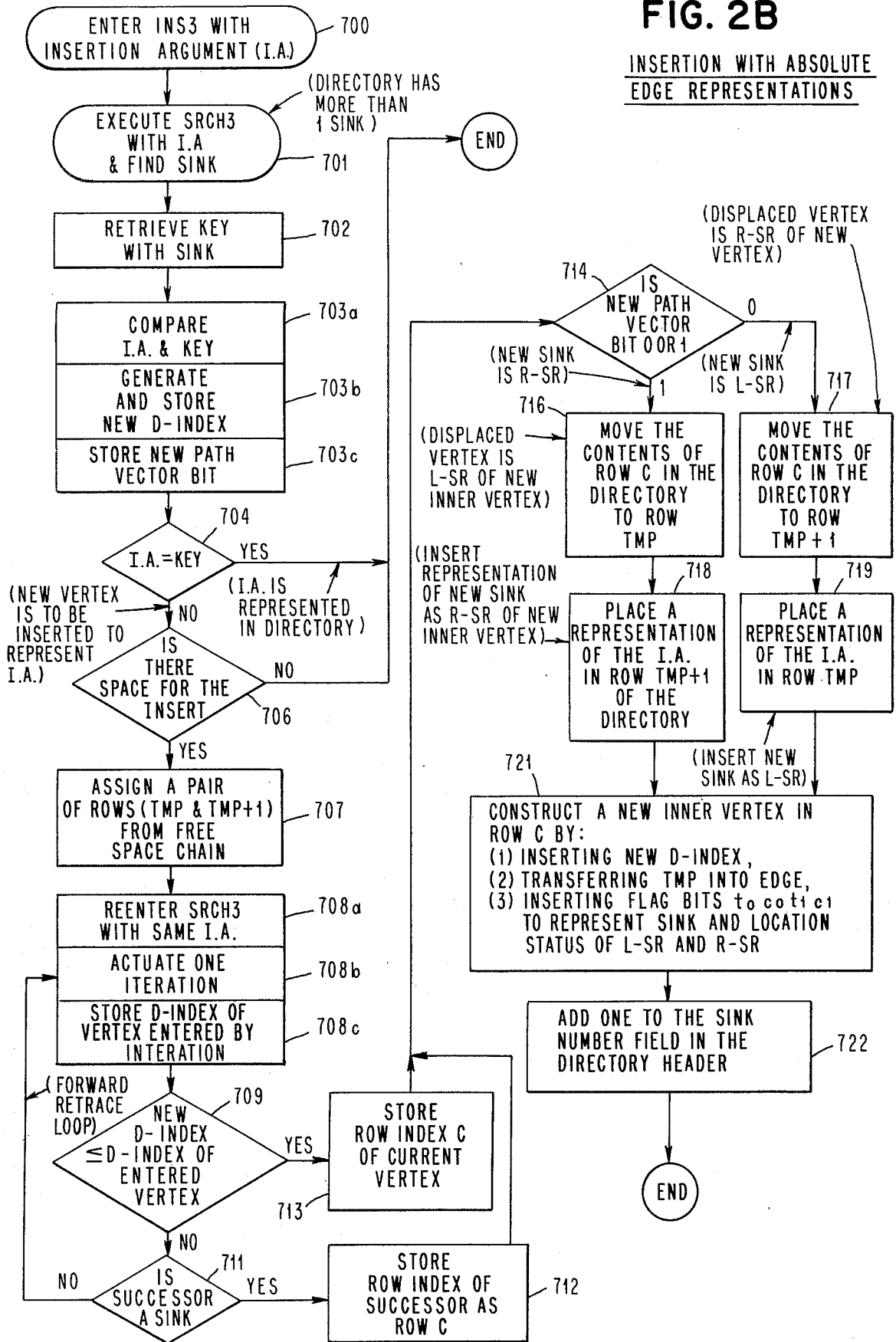
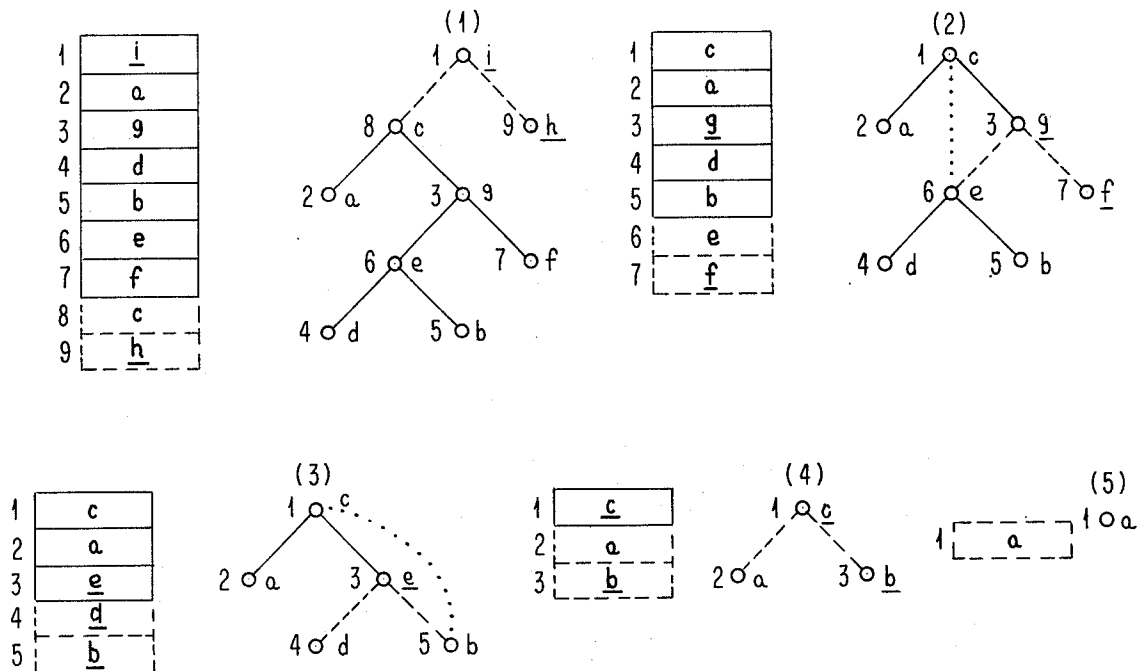


FIG. 3A DELETION



LEGEND

- VERTEX
 - PRIOR INSERTED EDGE BETWEEN PRIOR VERTICES.
 - DELETED EDGE TO A SUCCESSOR
 -○ EDGE TO NEW SUCCESSOR.
 - c UNDERLINE INDICATES VERTEX TO BE DELETED.
 - c NO UNDERLINE INDICATES VERTEX TO REMAIN AFTER DELETION.
 - [] DELETED ENTRY FROM DIRECTORY.
 - [] REMAINING ENTRY IN DIRECTORY.
- i, h, g, f, ETC. REPRESENT ORDER OF DELETION.
 1, 2, 3, ETC. ARE INDICES OF DIRECTORY ROWS REPRESENTING THE VERTICES.

FIG. 3B

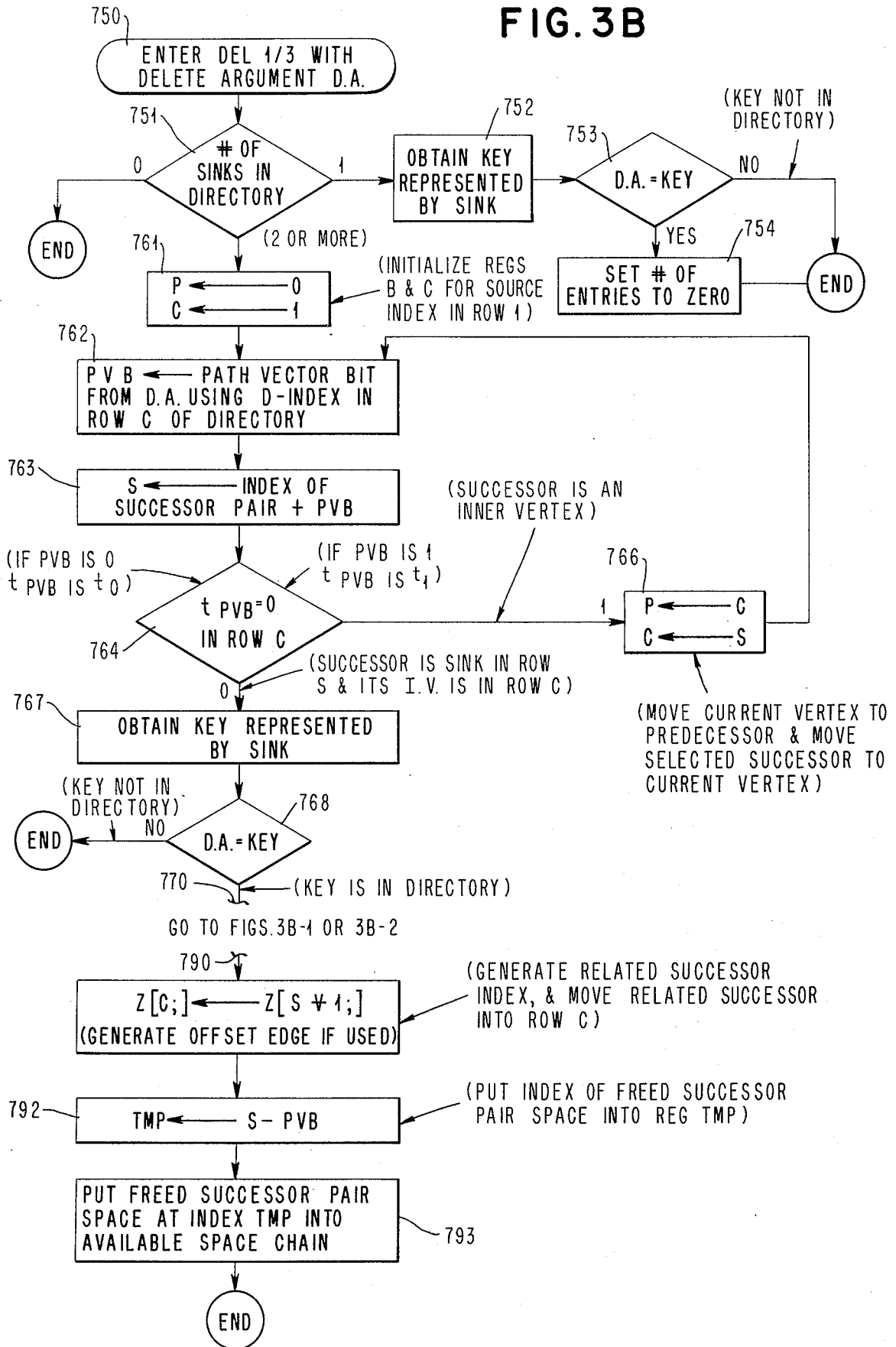


FIG. 3B-1

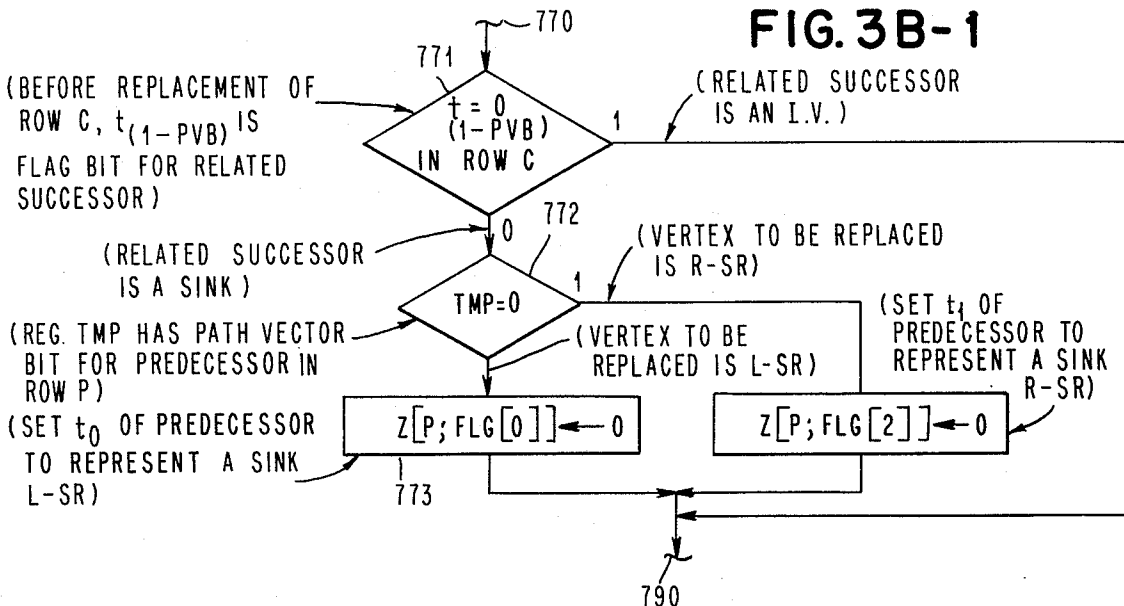
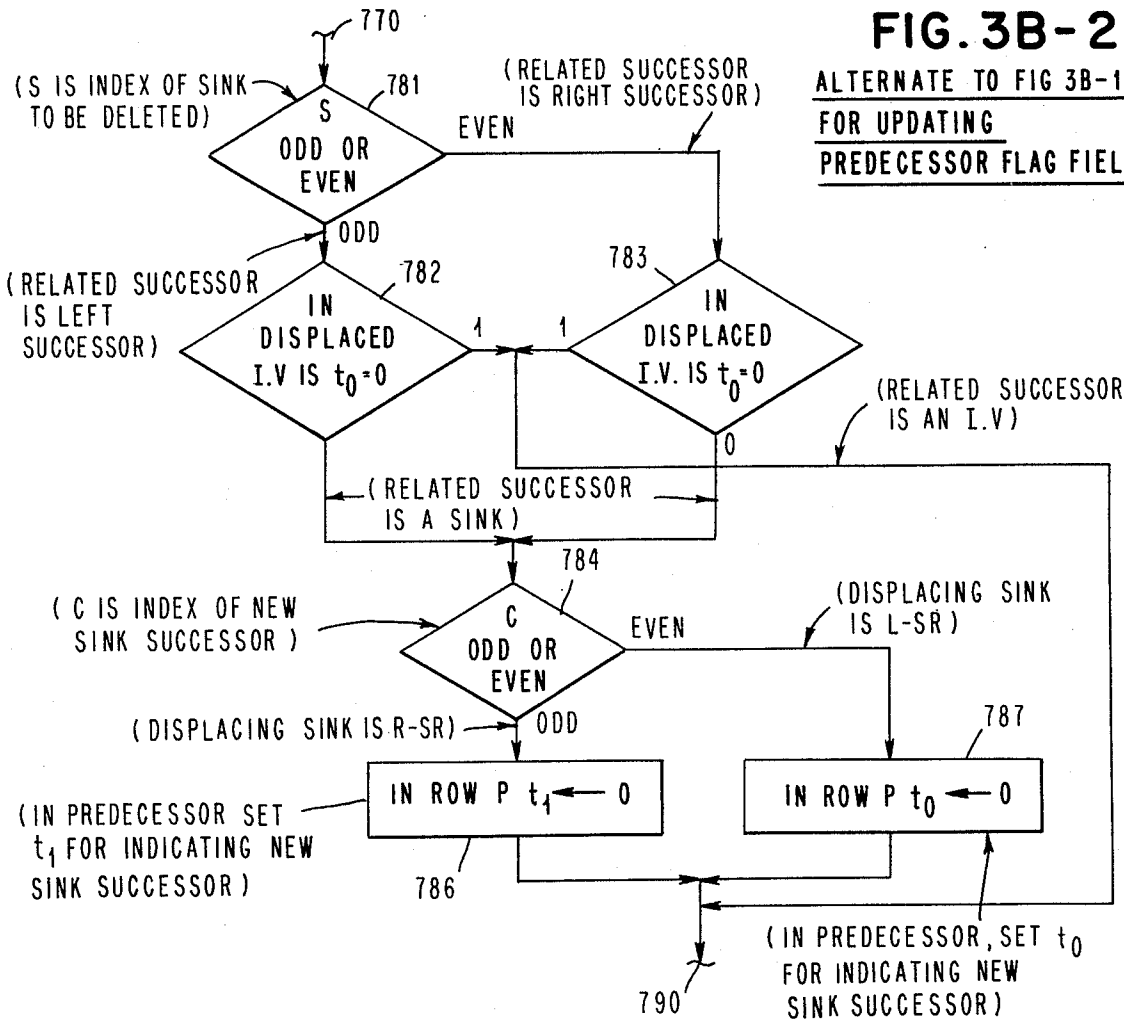


FIG. 3B-2

ALTERNATE TO FIG 3B-1
 FOR UPDATING
 PREDECESSOR FLAG FIELD.



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FIG. 3C

FIELDS / REGISTERS

@ Z	ADDRESS OF DIRECTORY SOURCE VERTEX
@ A	ADDRESS OF SEARCH ARGUMENT
D	NEW D-INDEX
BT OR PVB	PATH VECTOR BIT
ADR	SEARCH PATH SINK
LFR	LEFT OR RIGHT SR FLAG BIT
TMP	TEMPORARY REGISTER
P	PREDECESSOR INDEX
C	CURRENT VERTEX INDEX
S	SUCCESSOR INDEX
CC	CONDITION CODE

FIG. 3E

INSERTION EXAMPLE

0	15	F34
19	D 35	F20
20	D 21	F22
21	@ K36	

FIG. 3D

AVAILABLE SPACE CHAINING

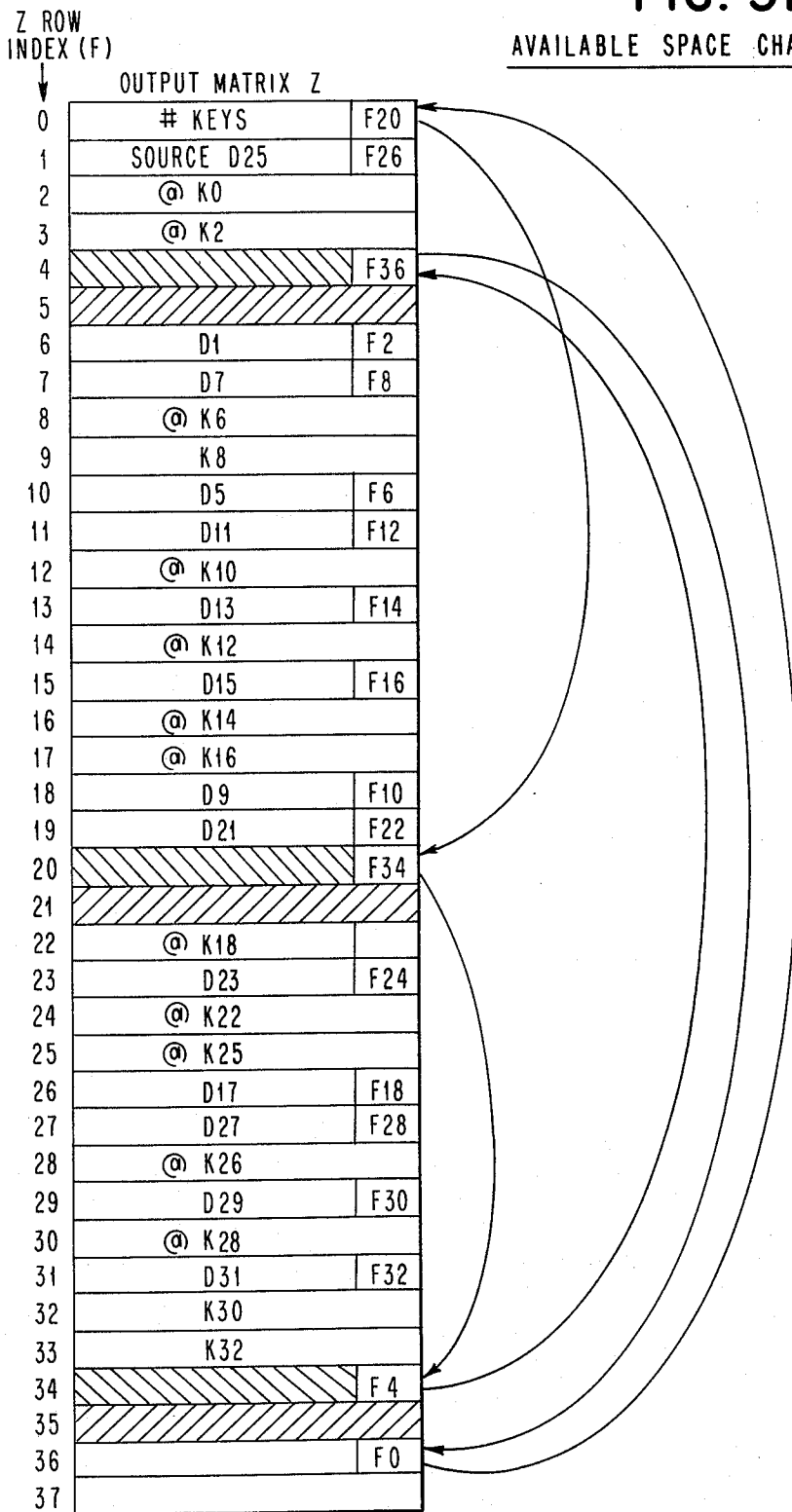


FIG. 4A

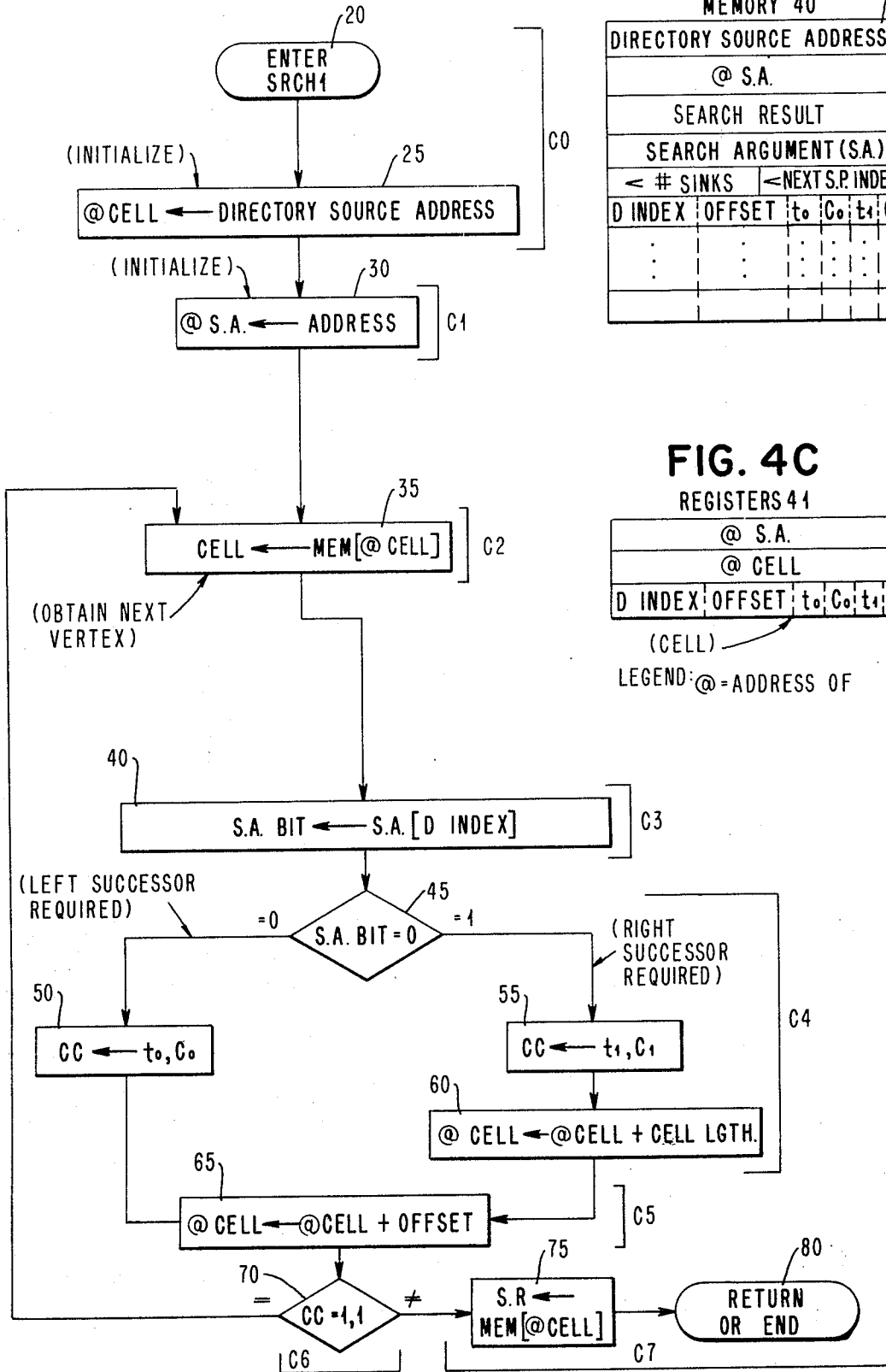


FIG. 4B

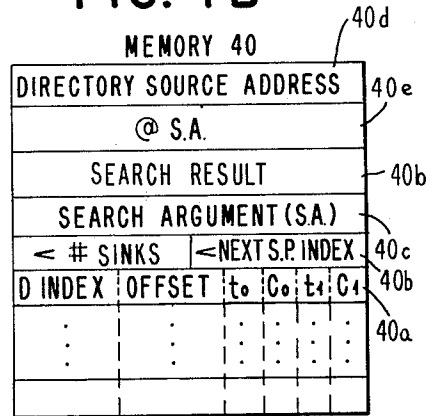


FIG. 4C

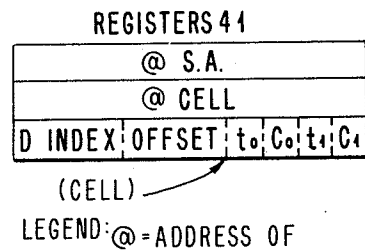


FIG. 5A

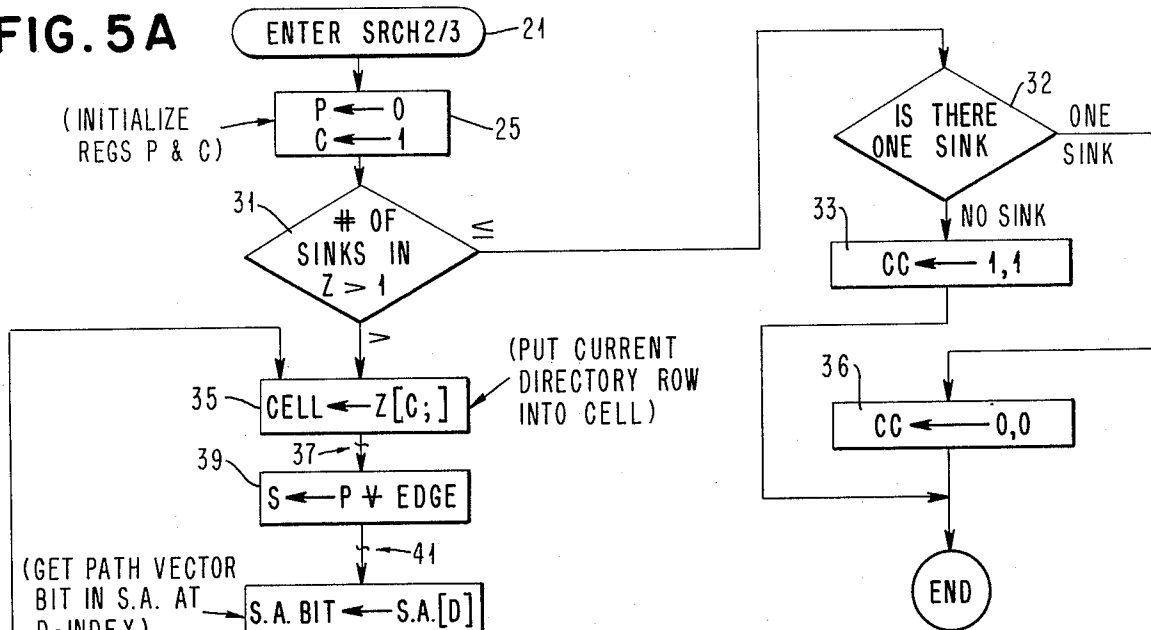
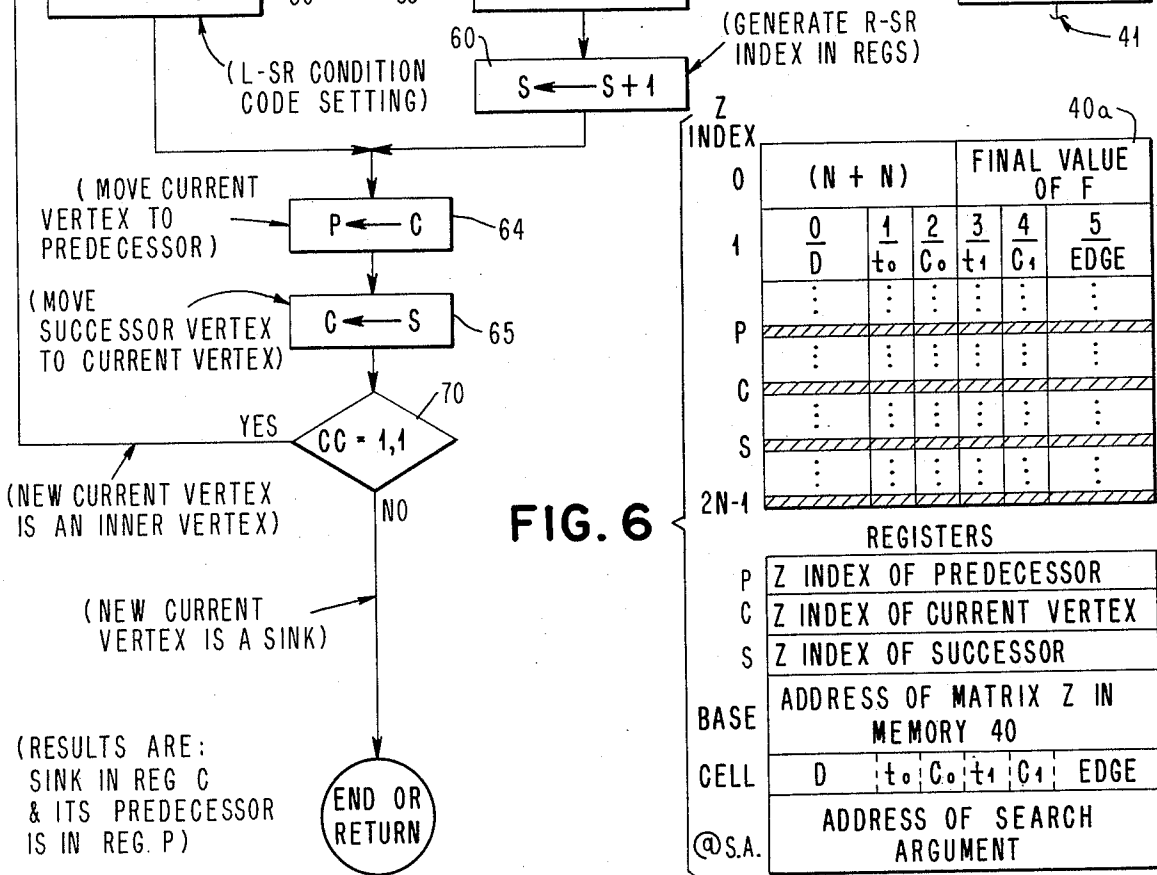
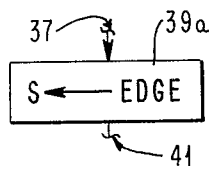


FIG. 5B
 (SRCH3)



INDEX	(N + N)					FINAL VALUE OF F
	0	1	2	3	4	
0	D	t ₀	C ₀	t ₁	C ₁	EDGE
1	:	:	:	:	:	:
P	:					
C	:	:	:	:	:	:
S	:					
2N-1	:	:	:	:	:	:

REGISTERS

P	Z INDEX OF PREDECESSOR
C	Z INDEX OF CURRENT VERTEX
S	Z INDEX OF SUCCESSOR
BASE	ADDRESS OF MATRIX Z IN MEMORY 40
CELL	D t ₀ C ₀ t ₁ C ₁ EDGE
@S.A.	ADDRESS OF SEARCH ARGUMENT

FIG. 6

(RESULTS ARE:
 SINK IN REG C
 & ITS PREDECESSOR
 IS IN REG. P)

END OR
 RETURN

FIG. 5C

INVERTIBLE EDGE REPRESENTATION OF BINARY TREE

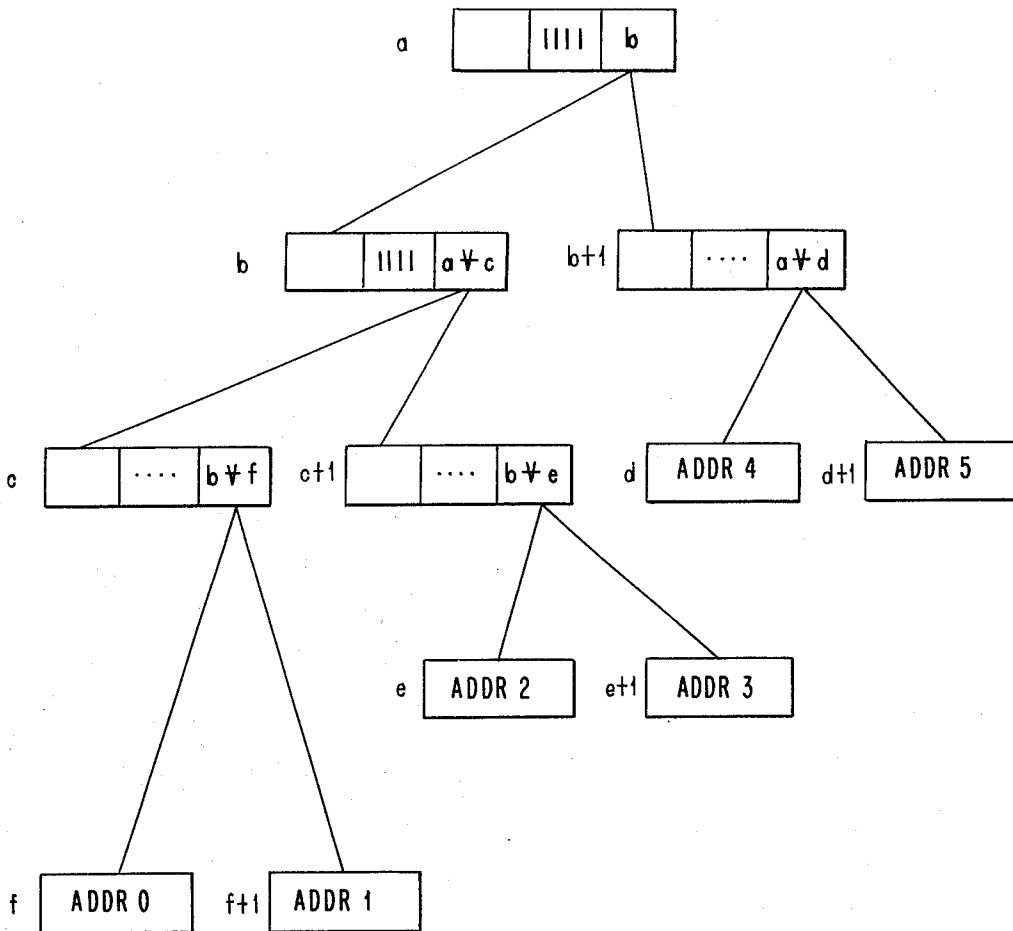


FIG. 5D



FIG. 7

DATA PATH

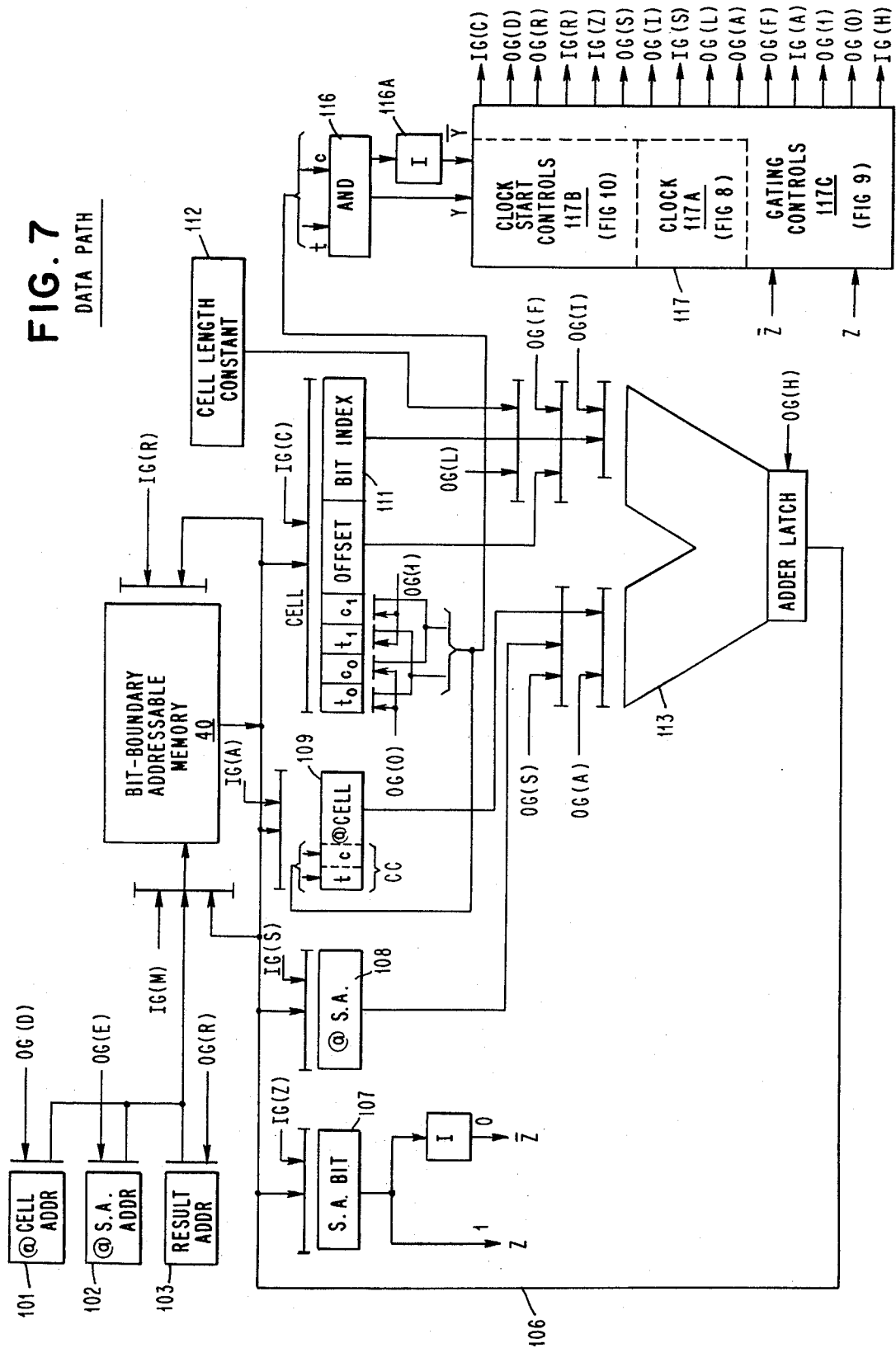


FIG. 9
GATING CONTROLS

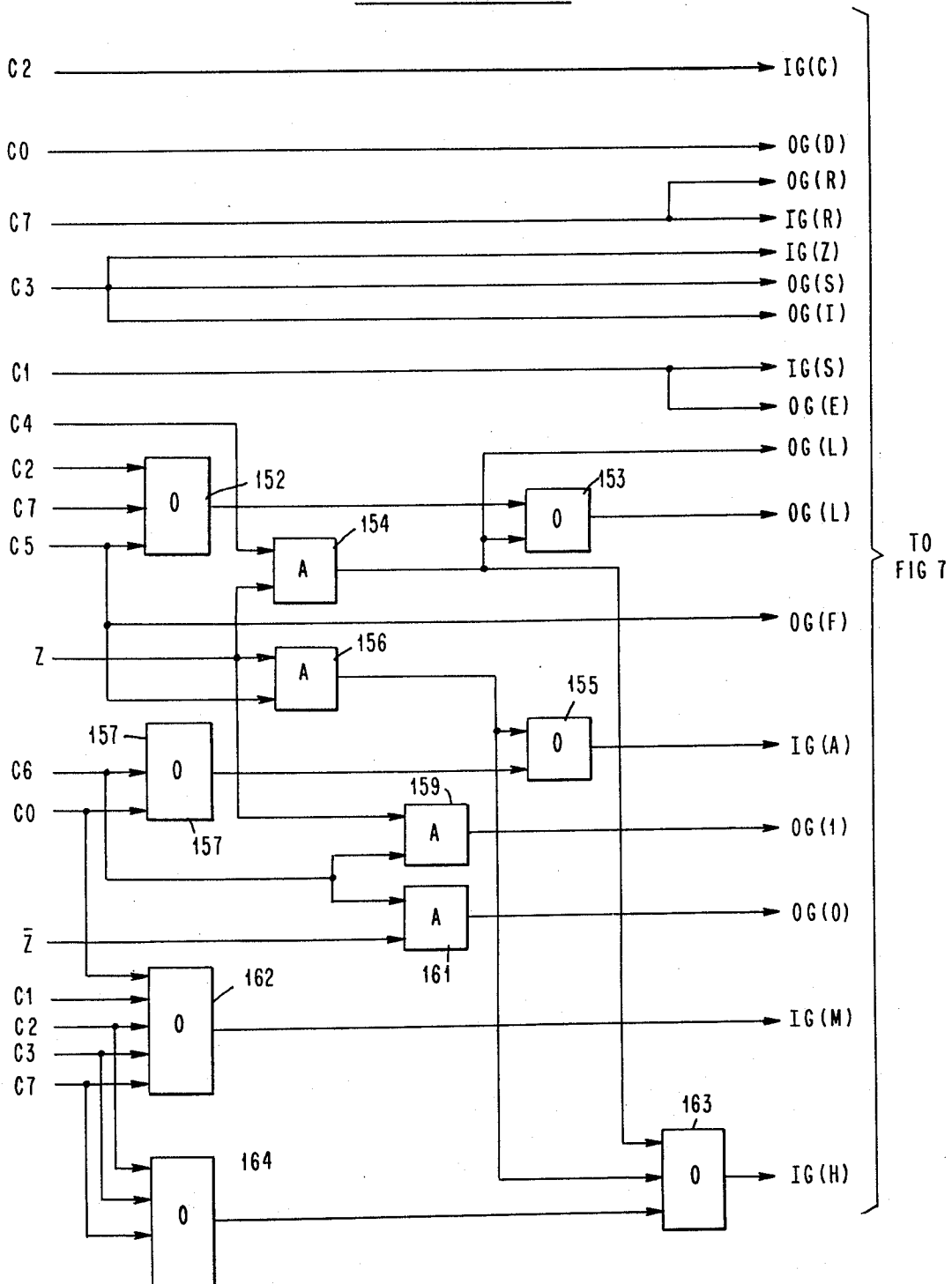
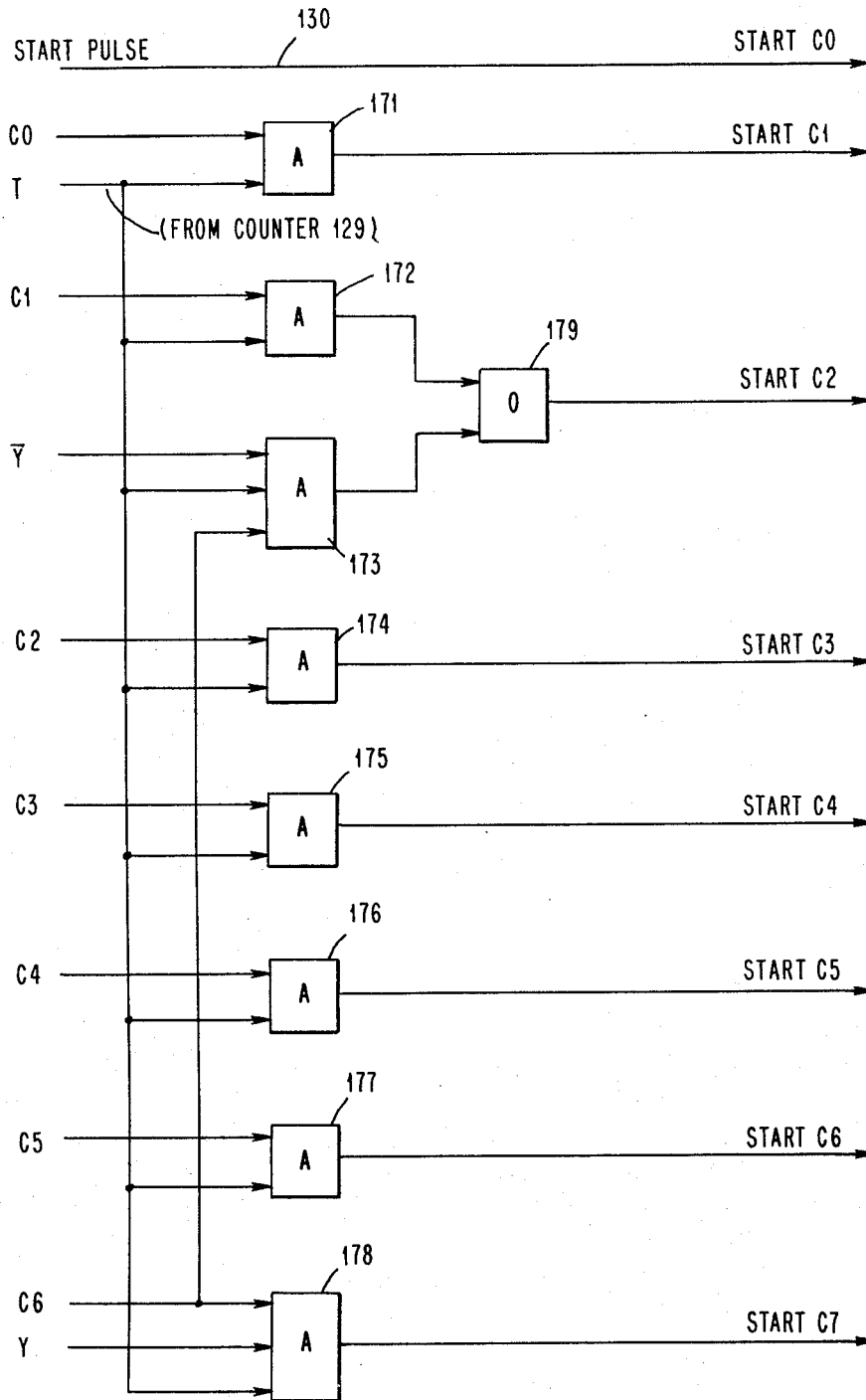


FIG. 10
CLOCK STARTING CONTROLS



DIRECTORY SIZE DETERMINATION

FIG. 11A

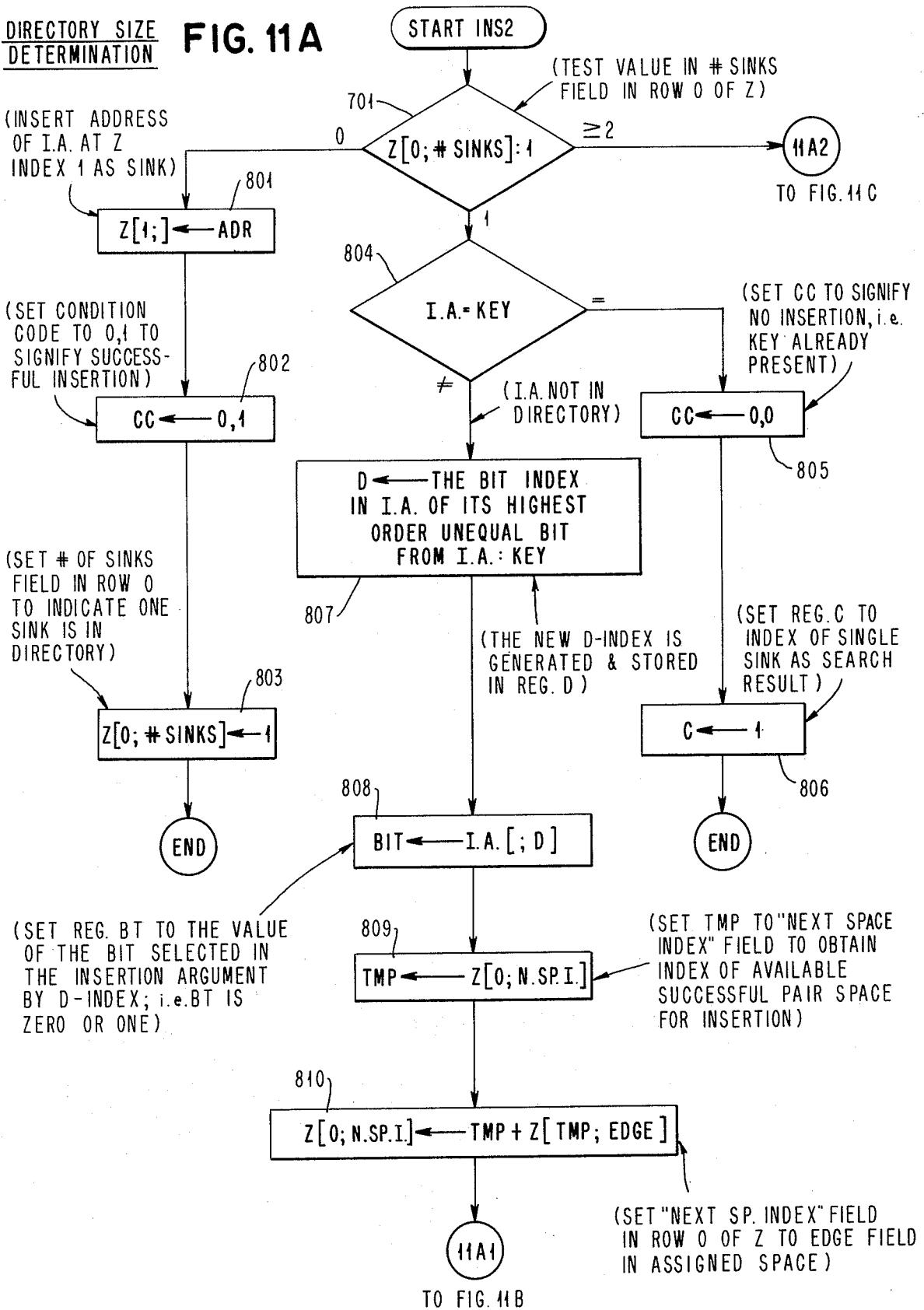


FIG. 11B

INSERTION INTO DIRECTORY
 CONTAINING ONE KEY

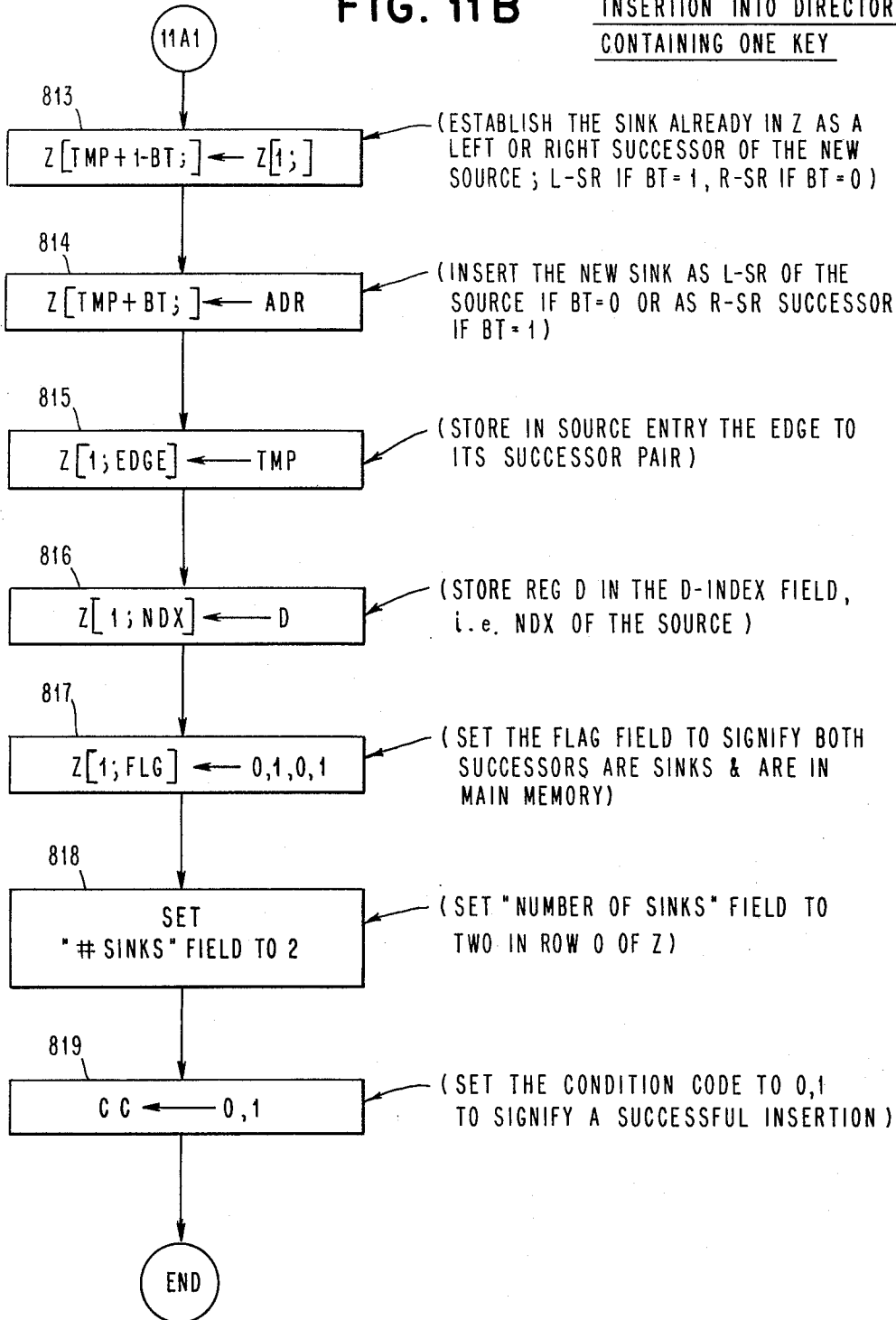


FIG. 11C

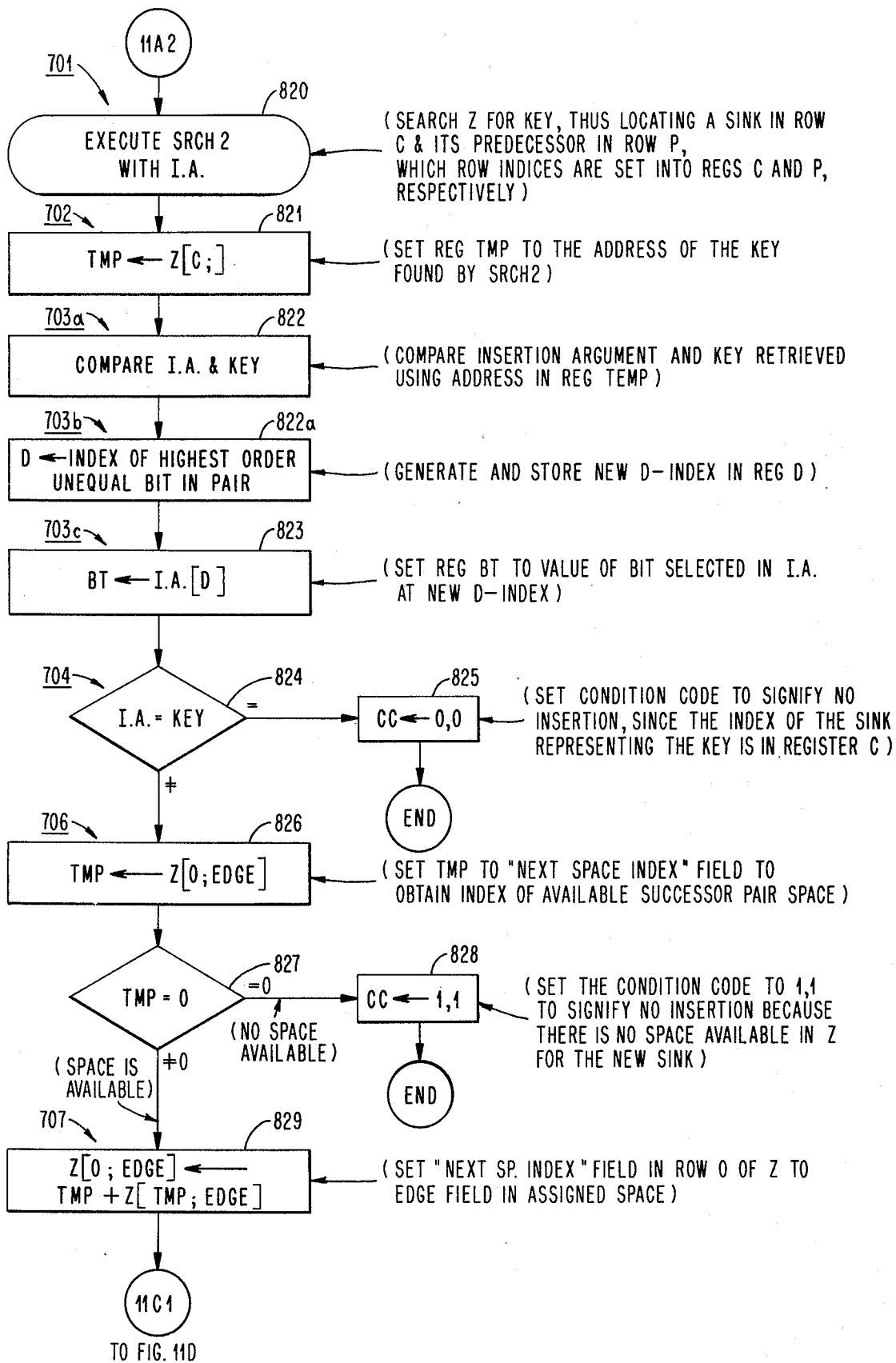
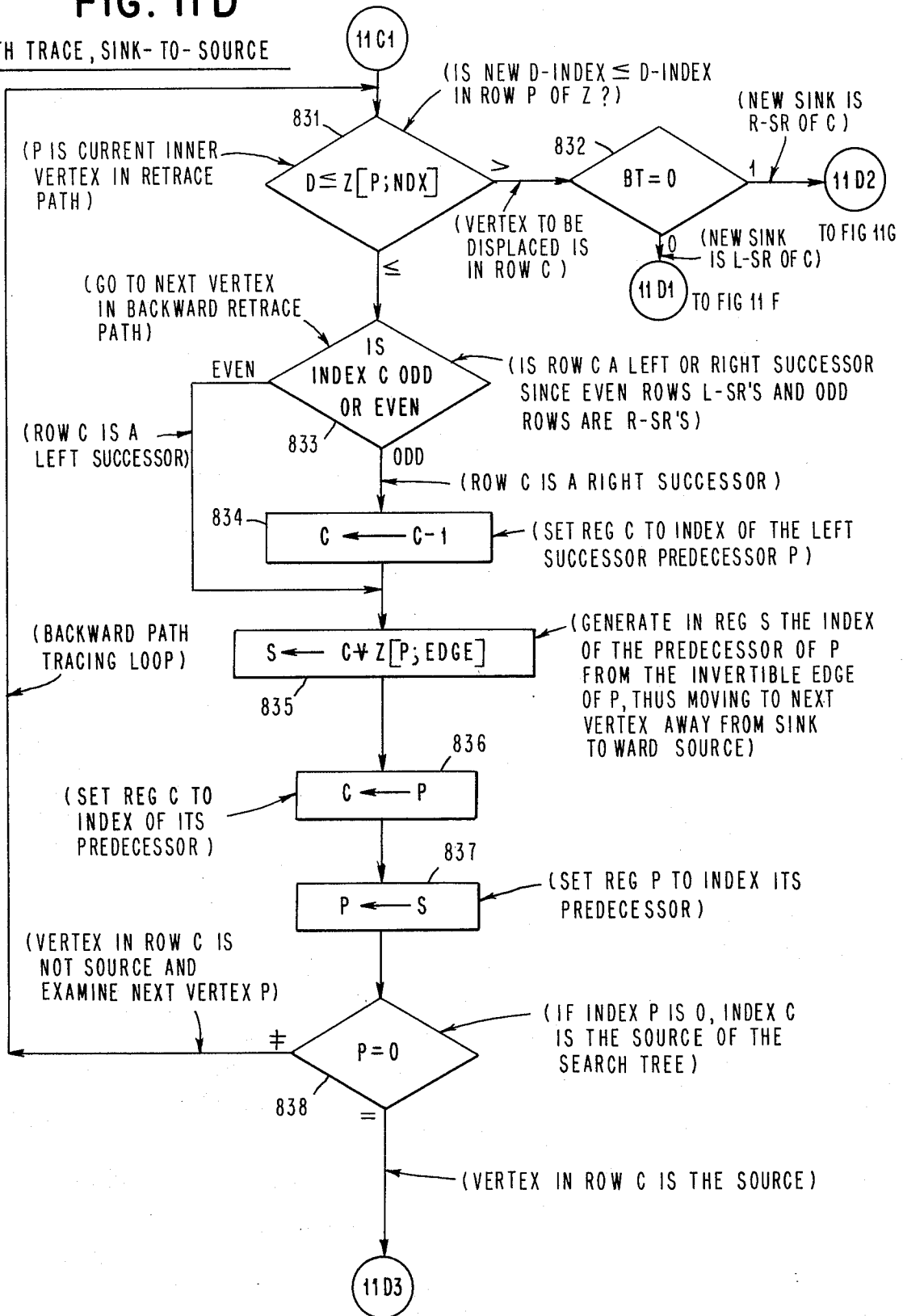


FIG. 11D

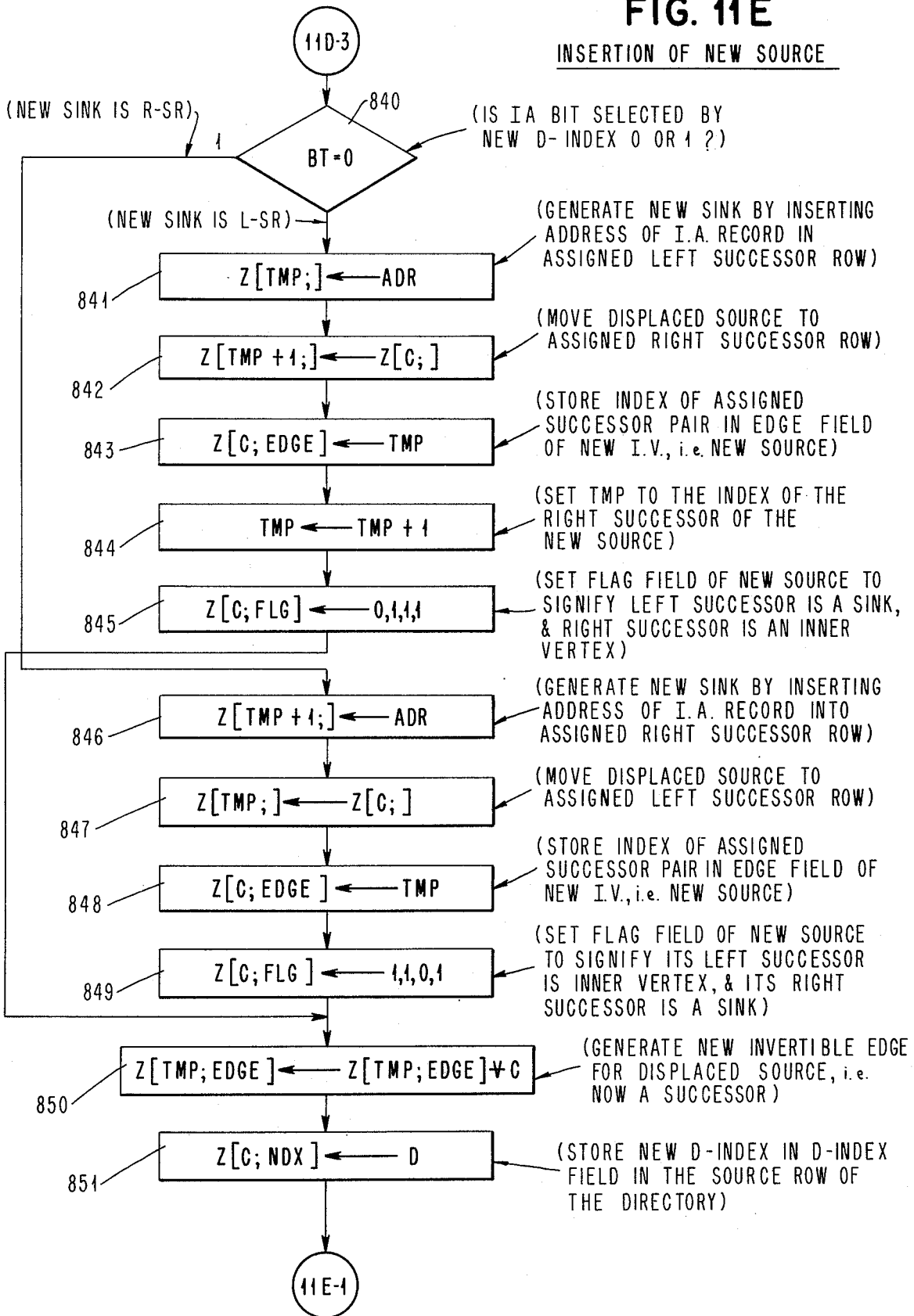
PATH TRACE, SINK-TO-SOURCE



TO FIG 11E

FIG. 11E

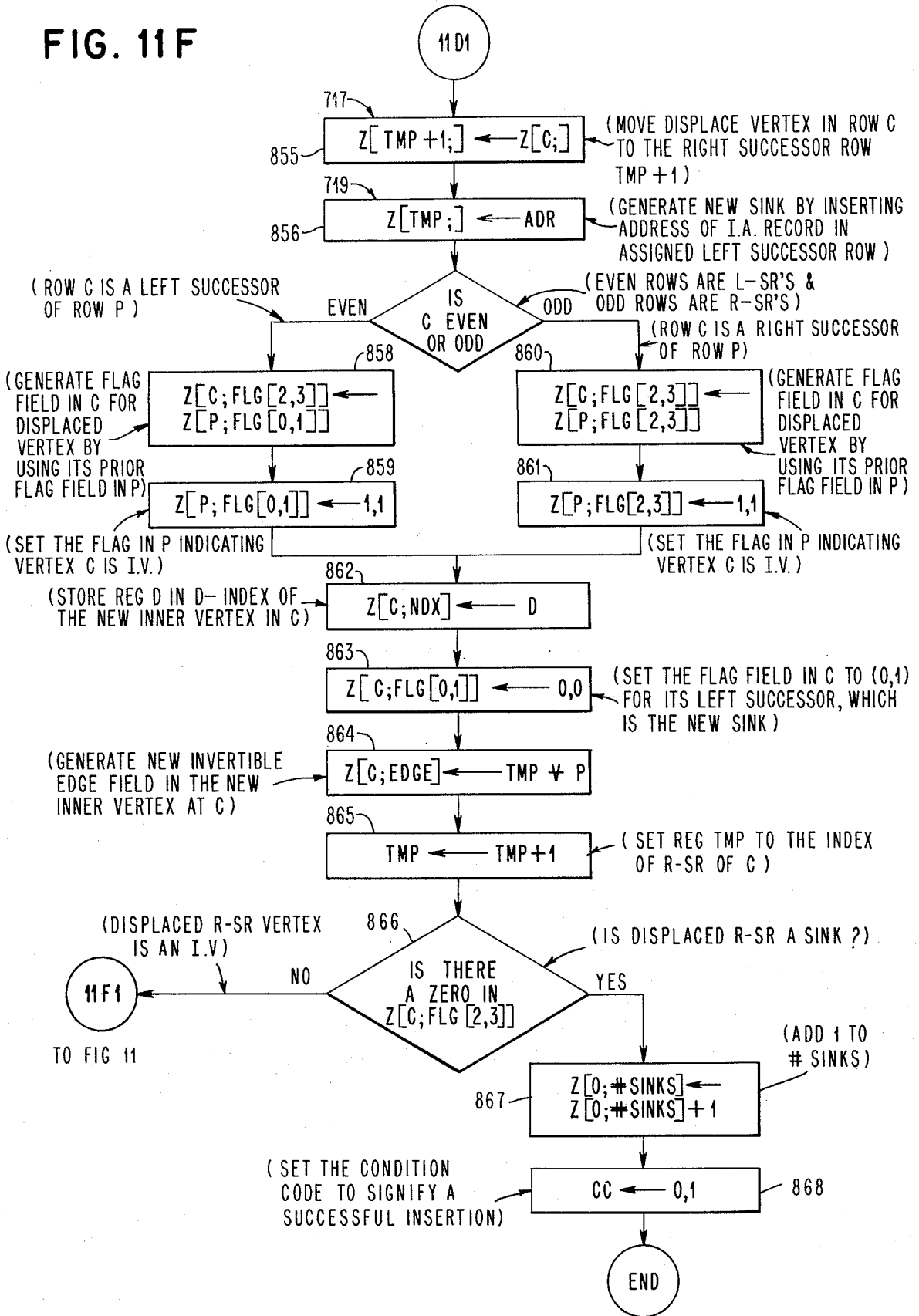
INSERTION OF NEW SOURCE



TO FIG. 11H

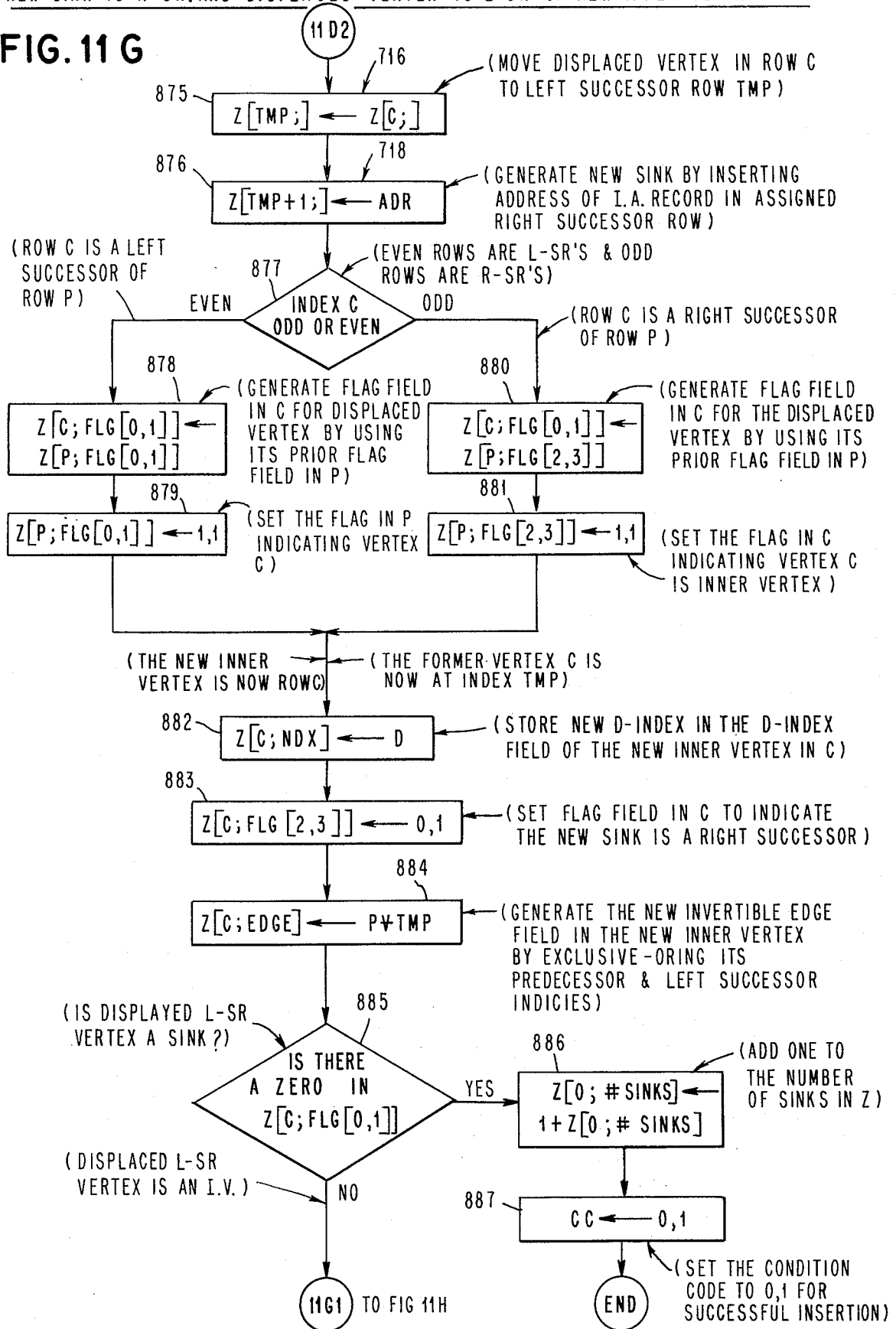
NEW SINK IS L-SR AND DISPLACED VERTEX IS R-SR OF NEW INNER VERTEX C

FIG. 11F



NEW SINK IS R-SR, AND DISPLACED VERTEX IS L-SR OF NEW INNER VERTEX C

FIG. 11 G



GENERATE INVERTIBLE EDGE FIELDS IN DISPLACED INNER VERTEX AND IN ITS INNER VERTEX SUCCESSORS

FIG. 11H

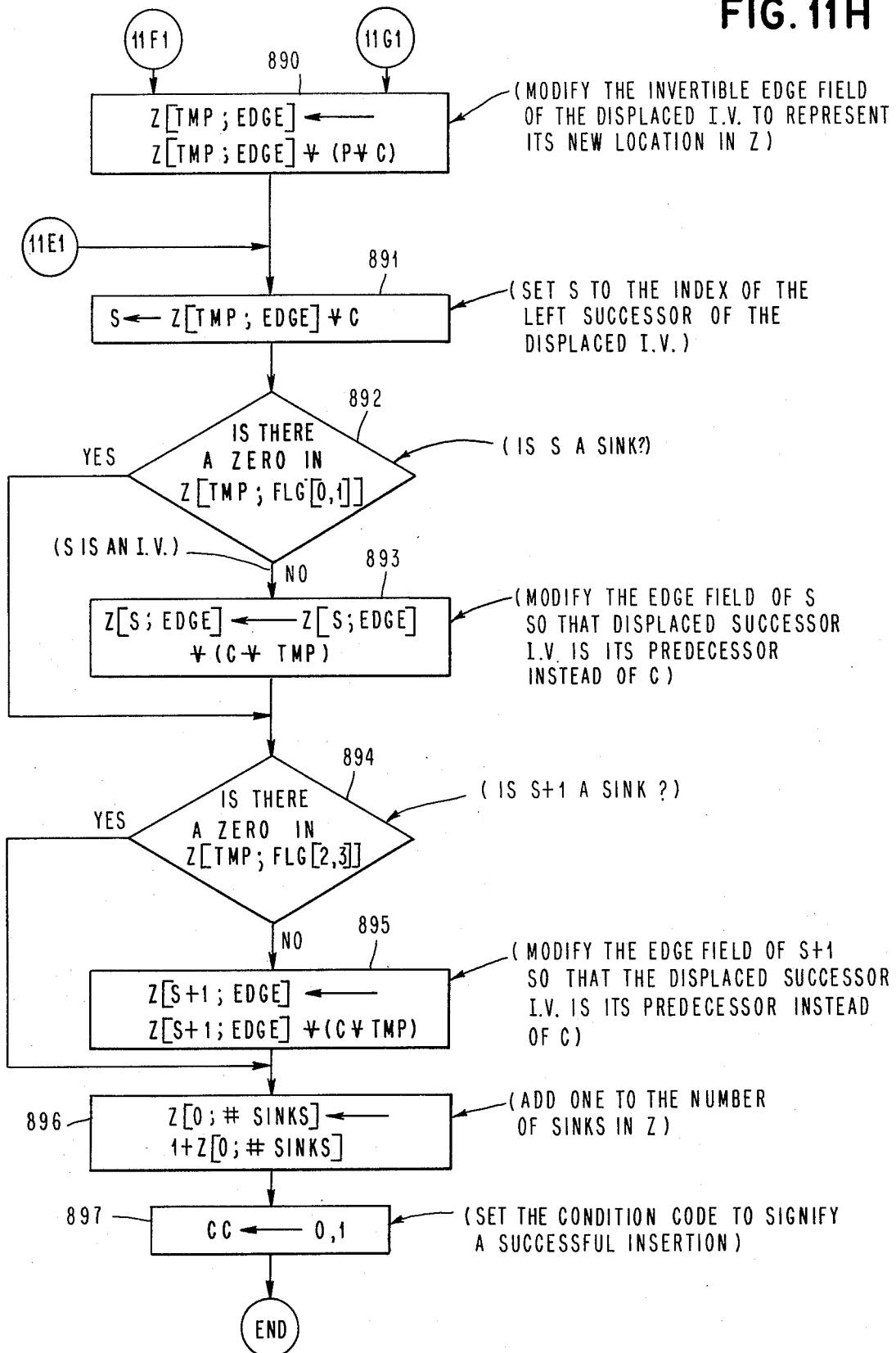


FIG. 12A

DIRECTORY SIZE DETERMINATION

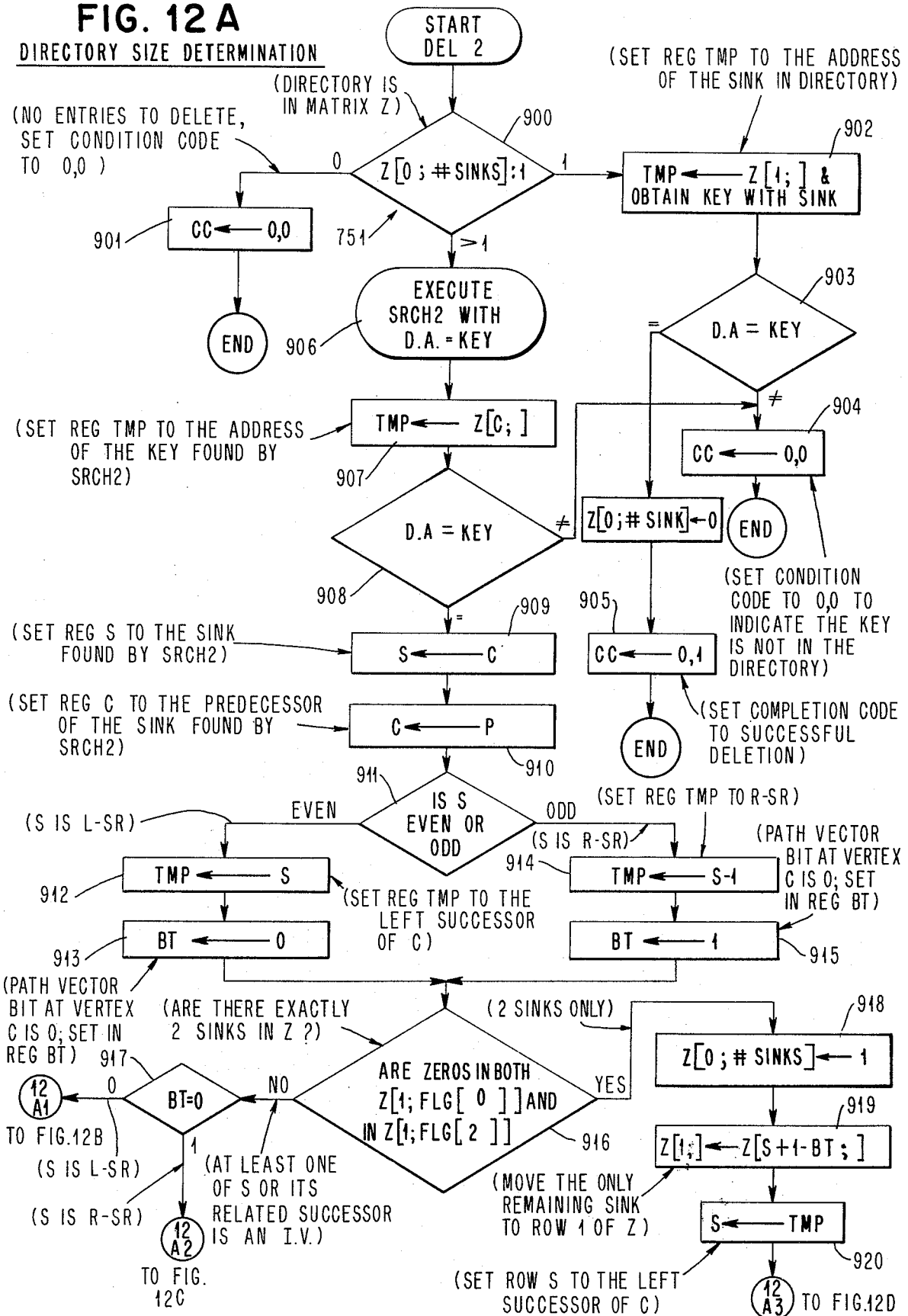


FIG. 12B

S IS A LEFT
 SUCCESSOR

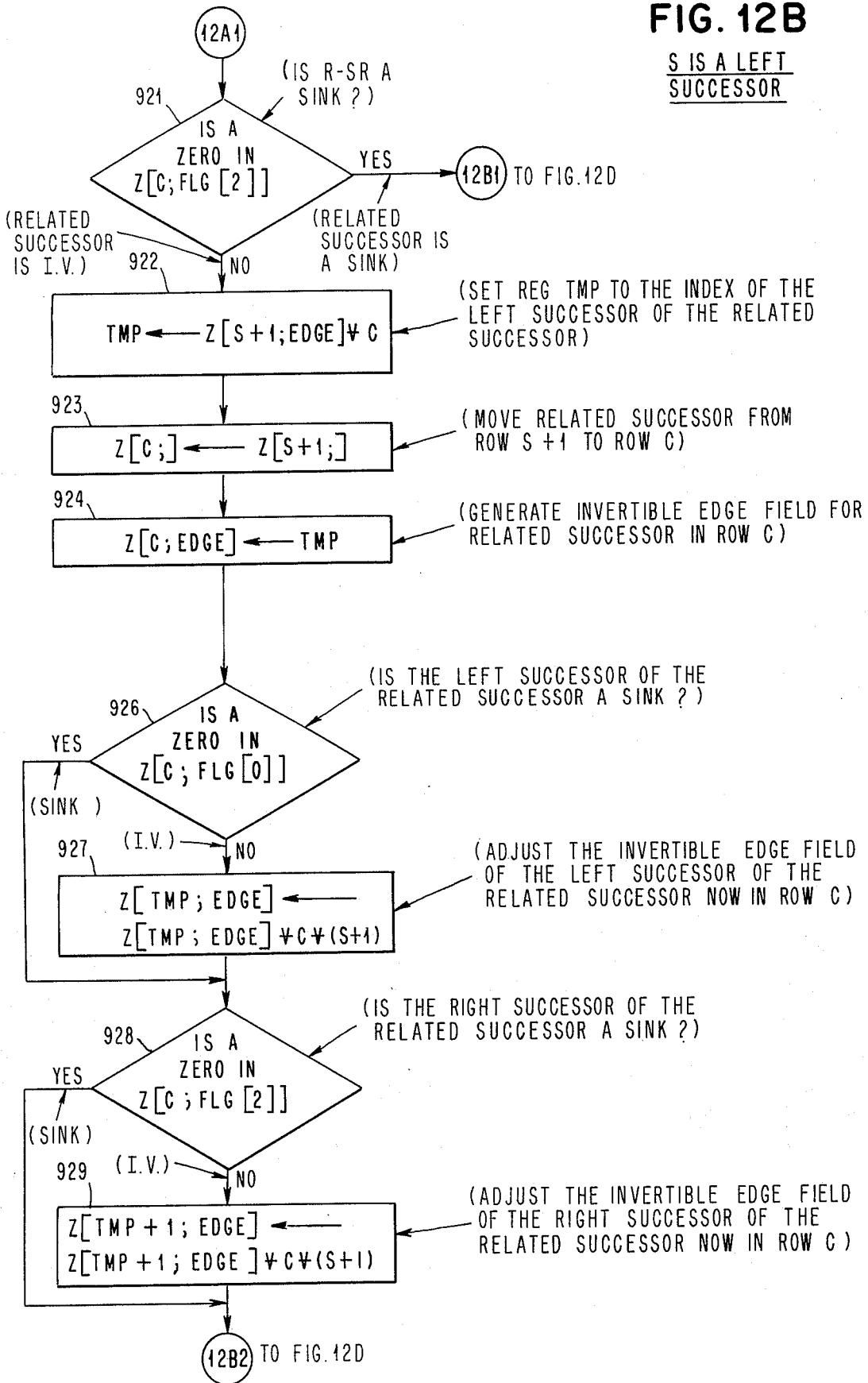
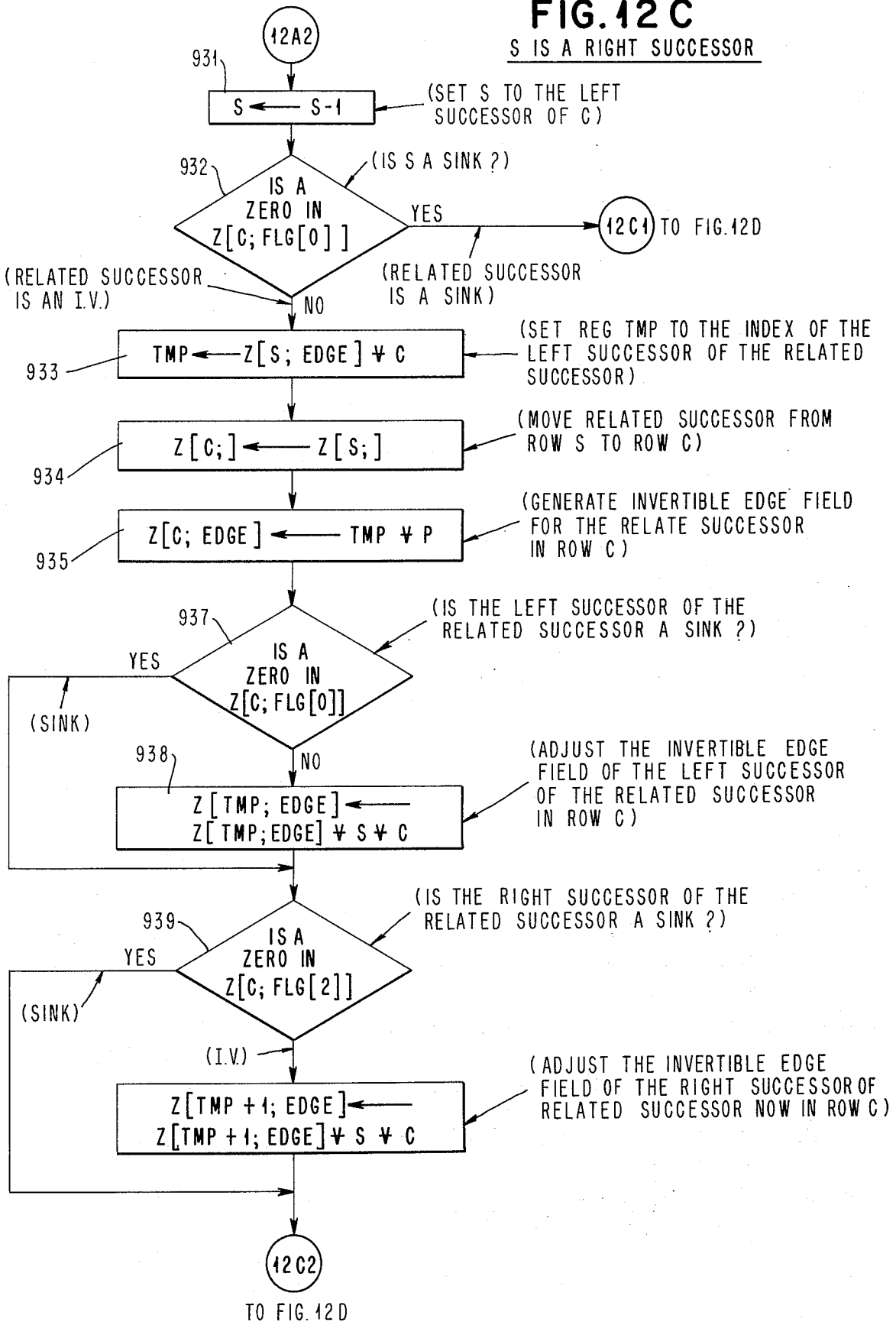


FIG. 12 C

S IS A RIGHT SUCCESSOR



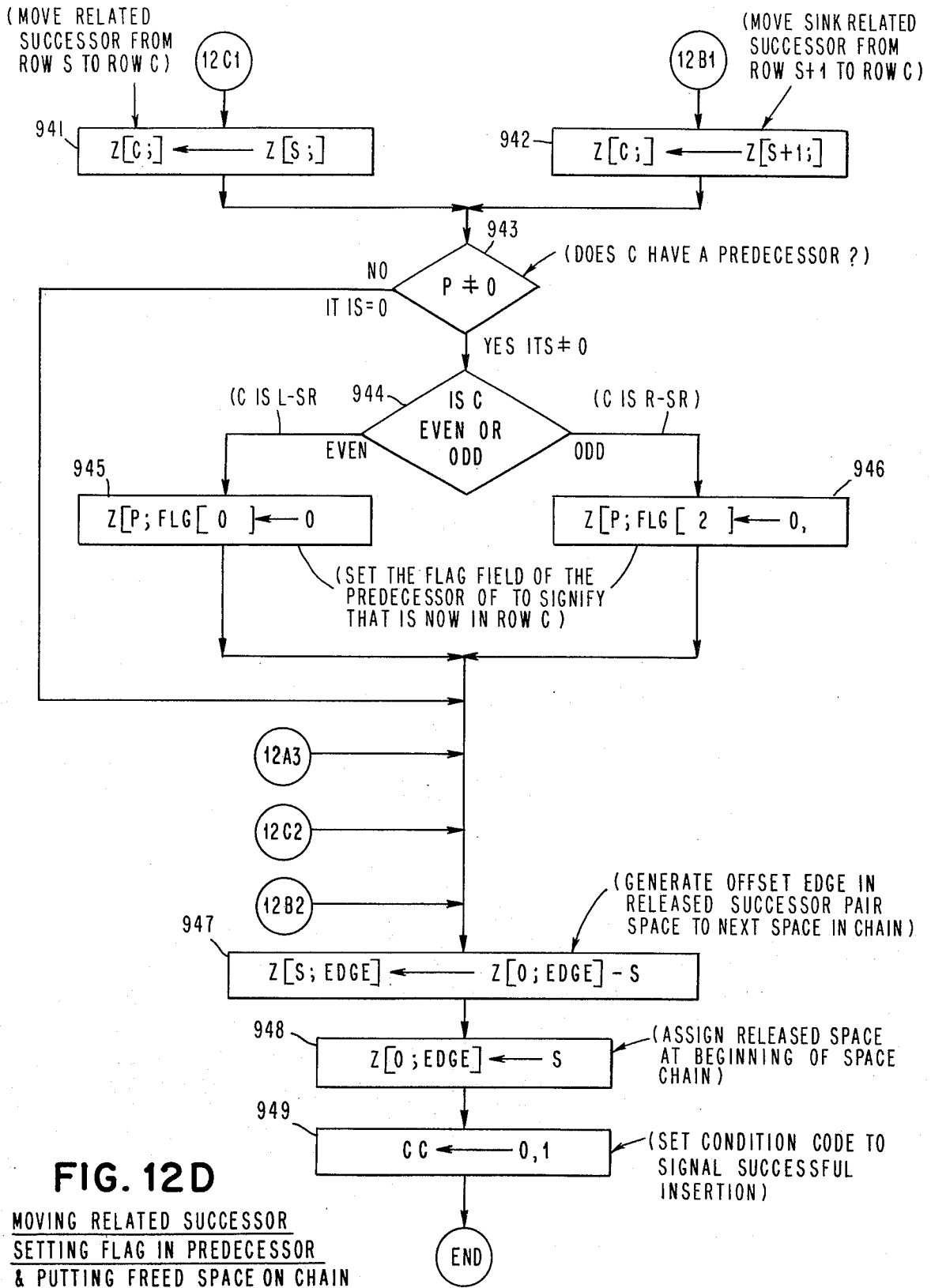


FIG. 12D

MOVING RELATED SUCCESSOR
SETTING FLAG IN PREDECESSOR
& PUTTING FREED SPACE ON CHAIN