FIG. 1

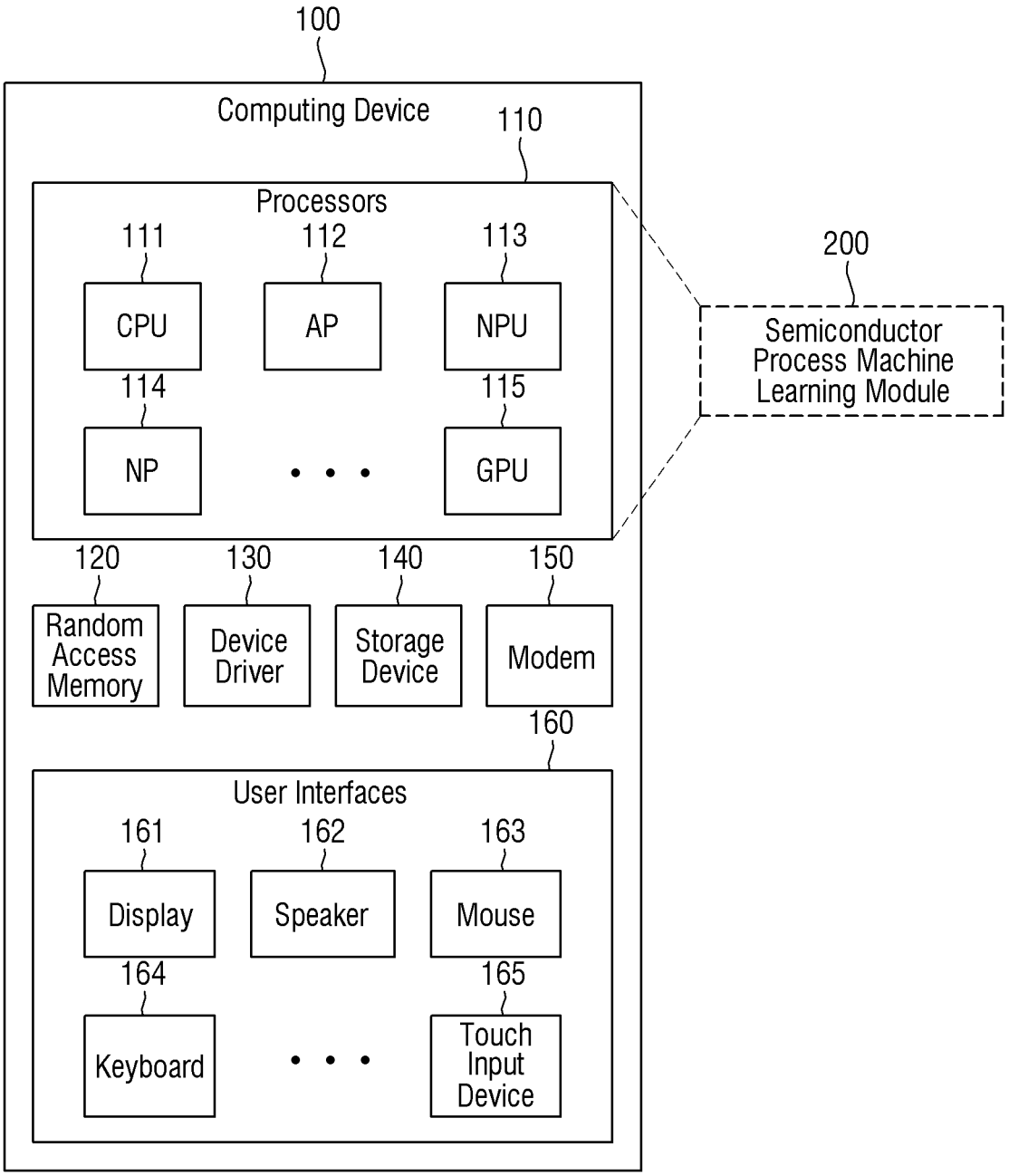

100
Computing Device
110
Processors
111
112
113
CPU
AP
NPU
114
115
NP
GPU
200
Semiconductor Process Machine Learning Module
120
130
140
150
Random Access Memory
Device Driver
Storage Device
Modem
160
User Interfaces
161
162
163
Display
Speaker
Mouse
164
165
Keyboard
Touch Input Device

FIG. 2

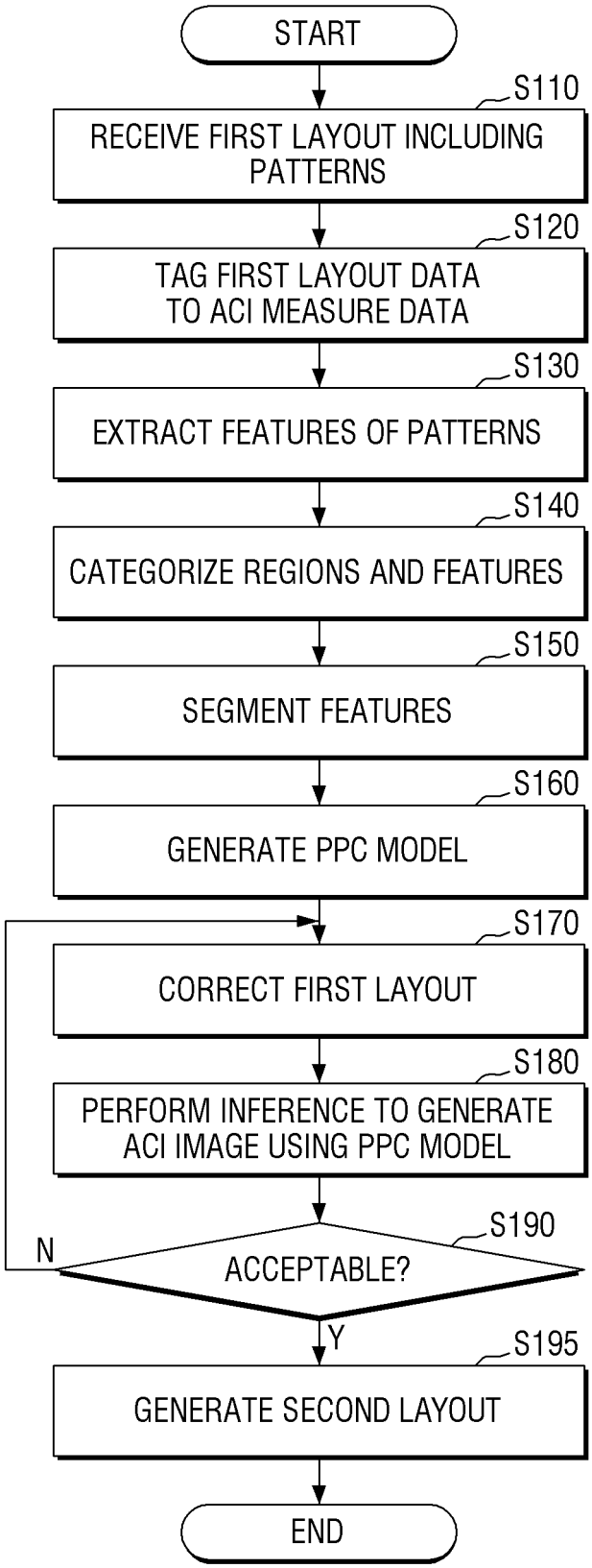

START
S110
RECEIVE FIRST LAYOUT INCLUDING PATTERNS
S120
TAG FIRST LAYOUT DATA TO ACI MEASURE DATA
S130
EXTRACT FEATURES OF PATTERNS
S140
CATEGORIZE REGIONS AND FEATURES
S150
SEGMENT FEATURES
S160
GENERATE PPC MODEL
S170
CORRECT FIRST LAYOUT
S180
PERFORM INFERENCE TO GENERATE ACI IMAGE USING PPC MODEL
S190
ACCEPTABLE?
N
Y
S195
GENERATE SECOND LAYOUT
END

FIG. 3

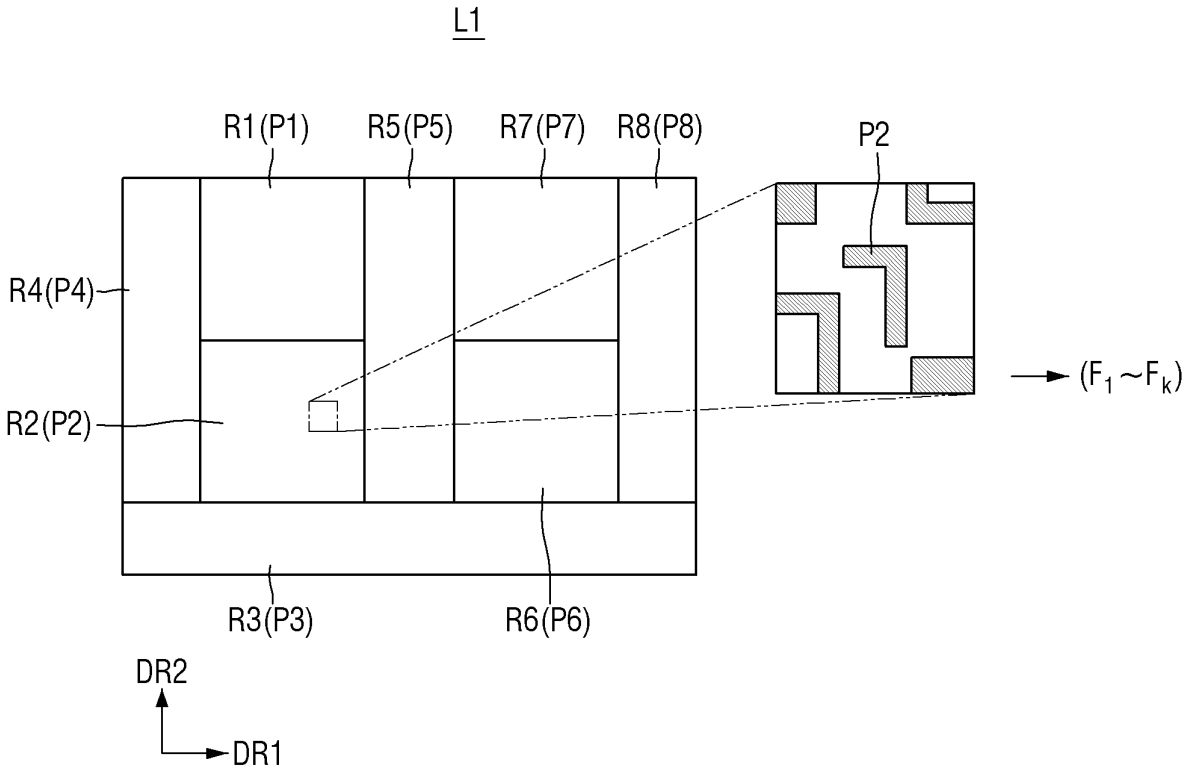

L1
R1(P1)
R5(P5)
R7(P7)
R8(P8)
P2
R4(P4)
R2(P2)
(F1~Fk)
R3(P3)
R6(P6)
DR2
DR1

FIG. 4

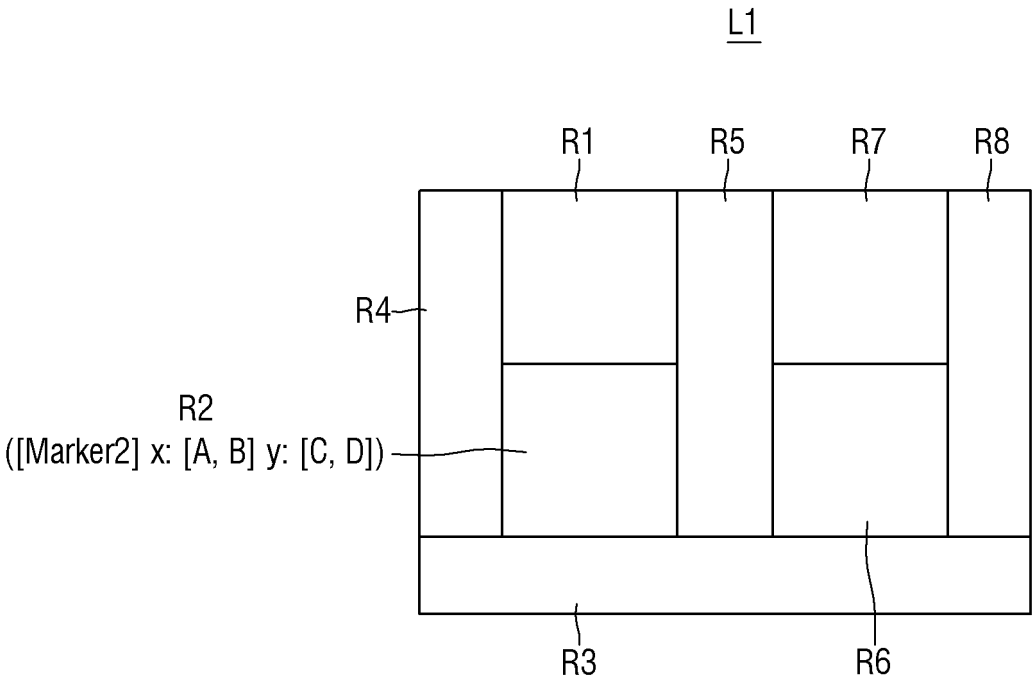

L1
R1
R5
R7
R8
R4
R2
([Marker2] x: [A, B] y: [C, D])
R3
R6

FIG. 5

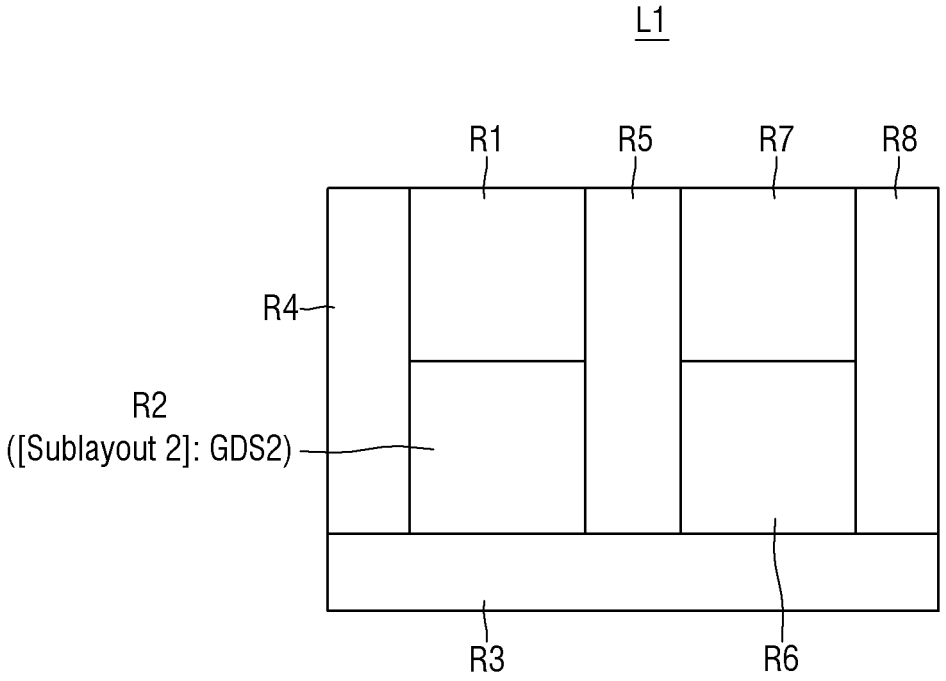

L1
R1
R5
R7
R8
R4
R2
([Sublayout 2]: GDS2)
R3
R6

FIG. 6

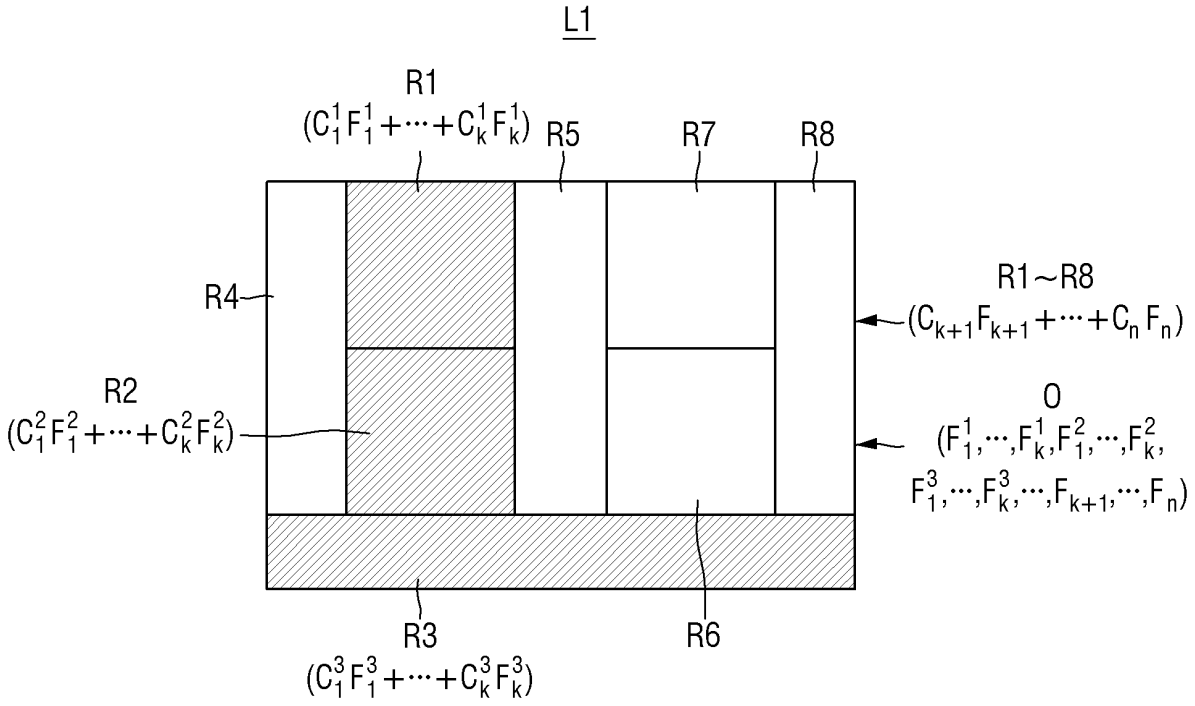

L1
R1
$(C_1^1F_1^1+\cdots+C_k^1F_k^1)$
R5
R7
R8
R4
R2
$(C_1^2F_1^2+\cdots+C_k^2F_k^2)$
R3
$(C_1^3F_1^3+\cdots+C_k^3F_k^3)$
R6
R1~R8
$(C_{k+1}F_{k+1}+\cdots+C_nF_n)$
0
$(F_1^1,\cdots,F_k^1,F_1^2,\cdots,F_k^2,$
$F_1^3,\cdots,F_k^3,\cdots,F_{k+1},\cdots,F_n)$

FIG. 7

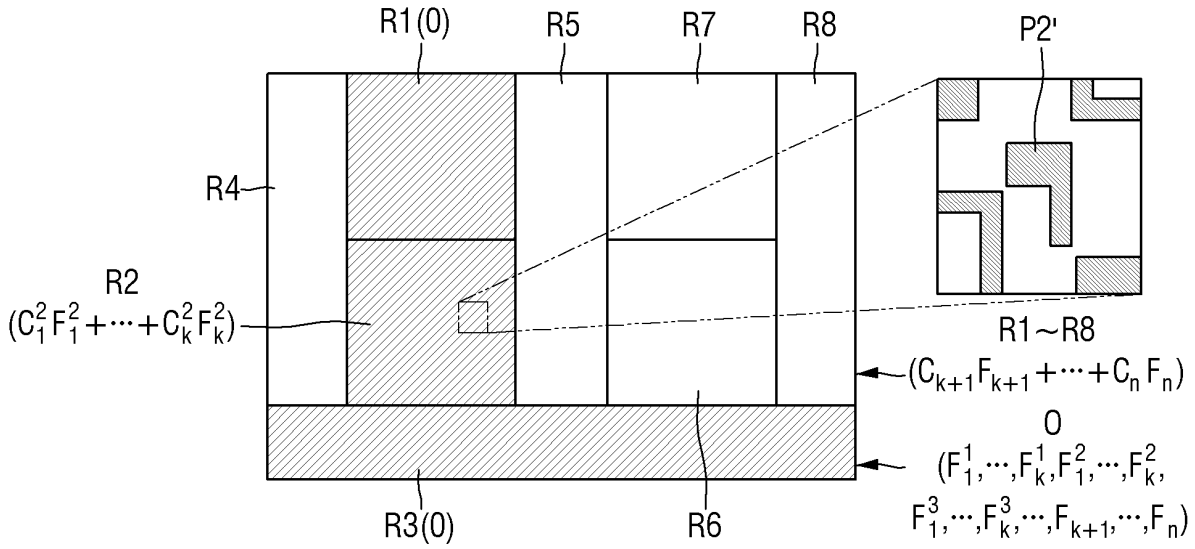

L1'
R1(0)
R5
R7
R8
P2'
R4
R2
$(C_1^2F_1^2+\cdots+C_k^2F_k^2)$
R1~R8
$(C_{k+1}F_{k+1}+\cdots+C_nF_n)$
0
$(F_1^1,\cdots,F_k^1,F_1^2,\cdots,F_k^2,$
$F_1^3,\cdots,F_k^3,\cdots,F_{k+1},\cdots,F_n)$
R3(0)
R6

FIG. 8

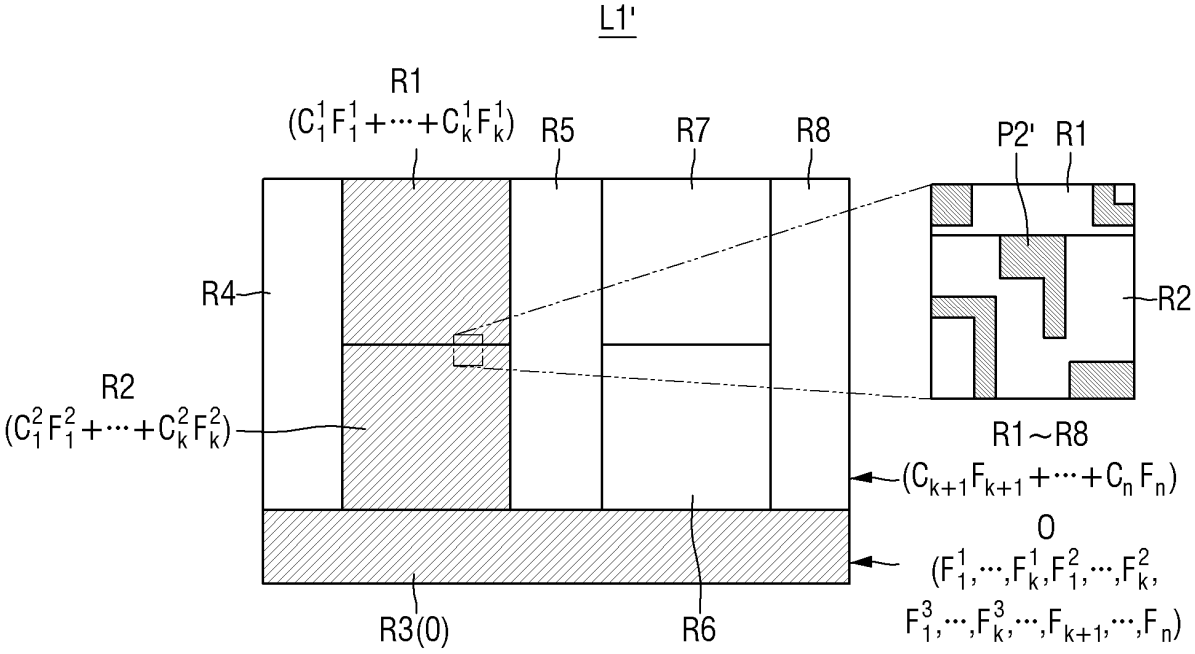

L1'
R1
$(C_1^1F_1^1+\cdots+C_k^1F_k^1)$
R5
R7
R8
P2'
R1
R4
R2
R2
$(C_1^2F_1^2+\cdots+C_k^2F_k^2)$
R1~R8
$(C_{k+1}F_{k+1}+\cdots+C_nF_n)$
0
$(F_1^1,\cdots,F_k^1,F_1^2,\cdots,F_k^2,$
$F_1^3,\cdots,F_k^3,\cdots,F_{k+1},\cdots,F_n)$
R3(0)
R6

FIG. 9

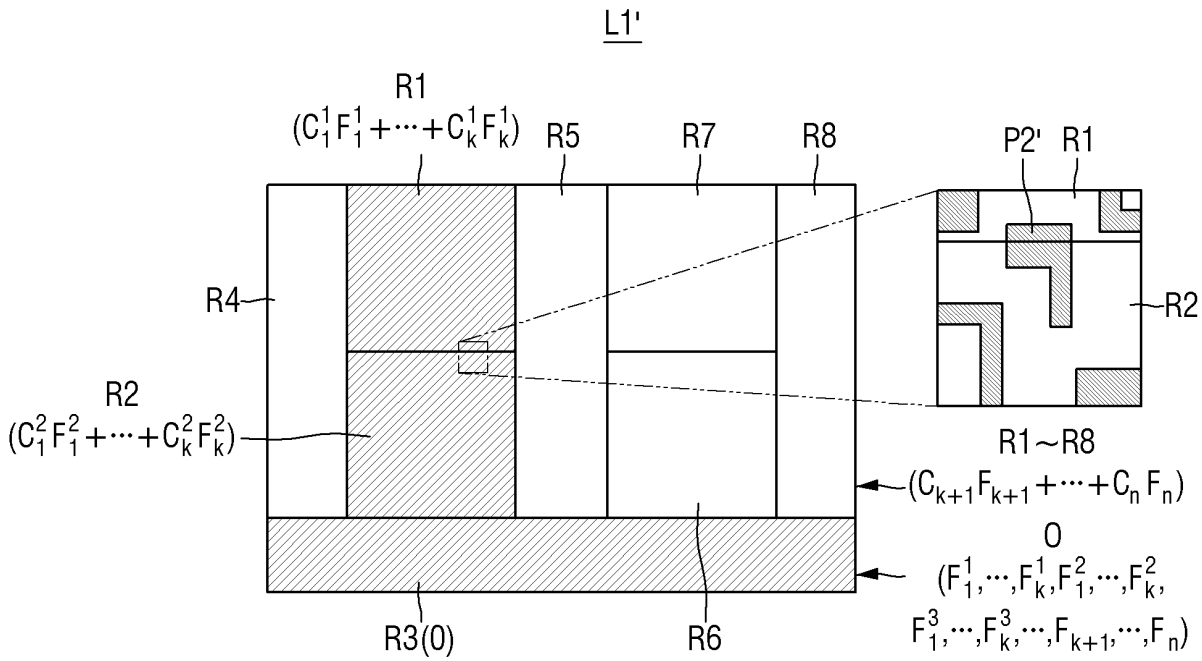

L1'
R1
$(C_1^1F_1^1+\cdots+C_k^1F_k^1)$
R5
R7
R8
P2'
R1
R4
R2
R2
$(C_1^2F_1^2+\cdots+C_k^2F_k^2)$
R1~R8
$(C_{k+1}F_{k+1}+\cdots+C_nF_n)$
0
$(F_1^1,\cdots,F_k^1,F_1^2,\cdots,F_k^2,$
$F_1^3,\cdots,F_k^3,\cdots,F_{k+1},\cdots,F_n)$
R3(0)
R6

FIG. 10

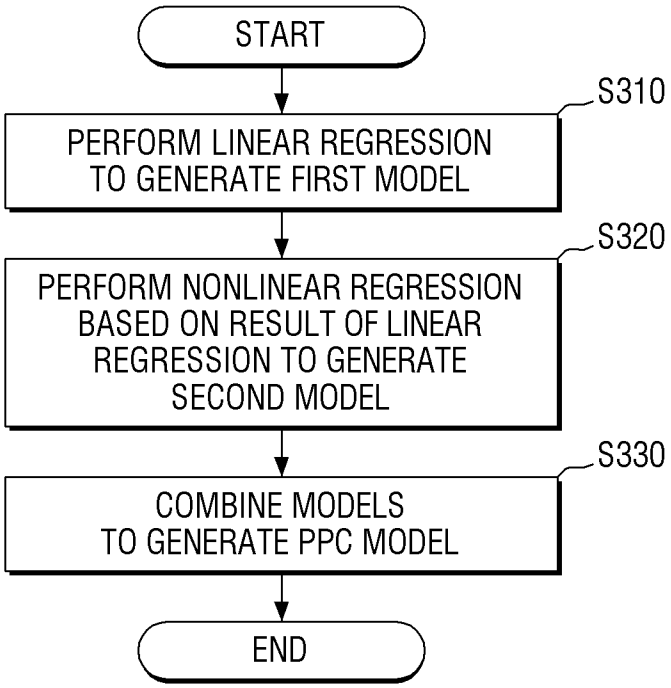

START
S310
PERFORM LINEAR REGRESSION TO GENERATE FIRST MODEL
S320
PERFORM NONLINEAR REGRESSION BASED ON RESULT OF LINEAR REGRESSION TO GENERATE SECOND MODEL
S330
COMBINE MODELS TO GENERATE PPC MODEL
END

FIG. 11

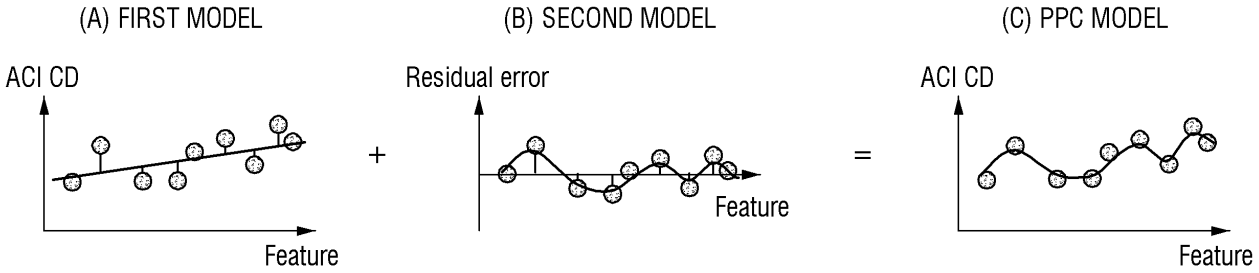

(A) FIRST MODEL
(B) SECOND MODEL
(C) PPC MODEL
ACI CD
Feature
+
Residual error
Feature
=
ACI CD
Feature

FIG. 12

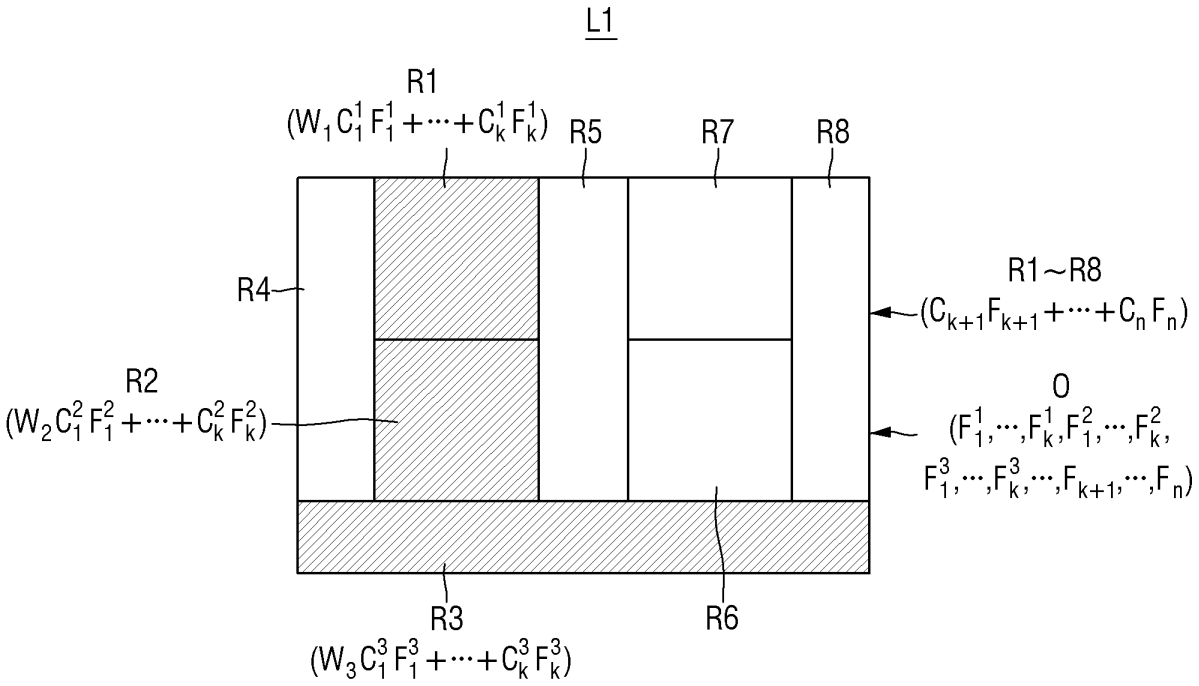

L1
R1
$(W_1C_1^1F_1^1+\cdots+C_k^1F_k^1)$
R5
R7
R8
R4
R2
$(W_2C_1^2F_1^2+\cdots+C_k^2F_k^2)$
R1~R8
$(C_{k+1}F_{k+1}+\cdots+C_nF_n)$
0
$(F_1^1,\cdots,F_k^1,F_1^2,\cdots,F_k^2,$
$F_1^3,\cdots,F_k^3,\cdots,F_{k+1},\cdots,F_n)$
R3
$(W_3C_1^3F_1^3+\cdots+C_k^3F_k^3)$
R6

FIG. 13

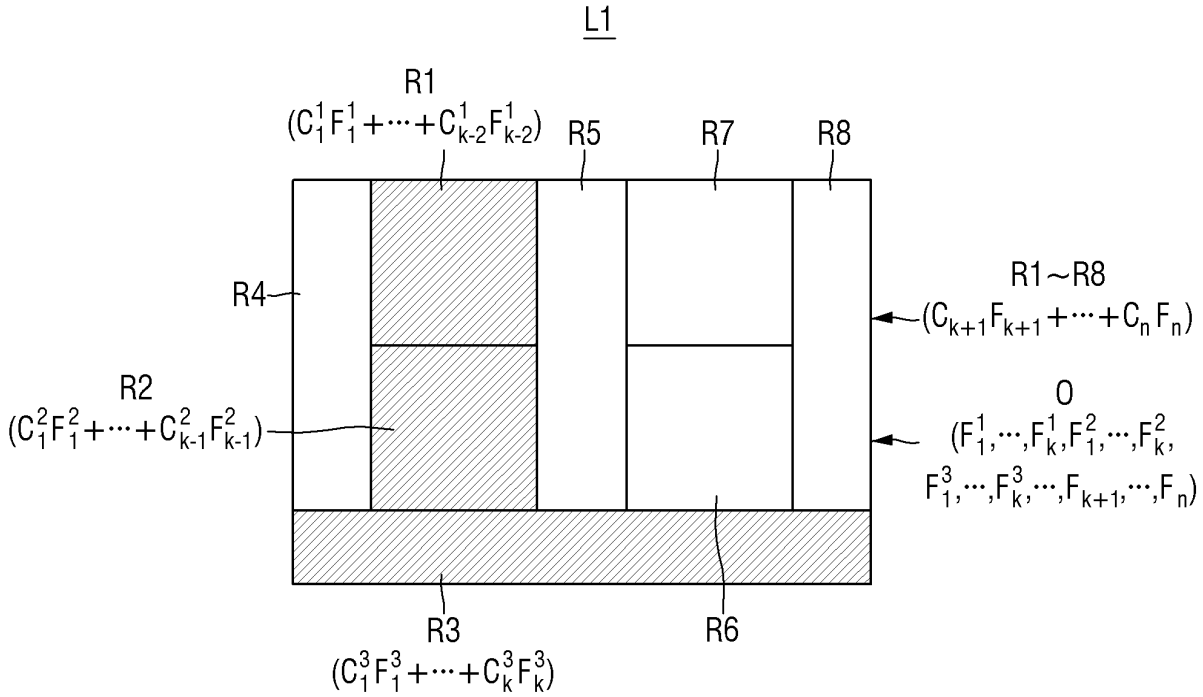

L1
R1
$(C_1^1F_1^1+\cdots+C_{k-2}^1F_{k-2}^1)$
R5
R7
R8
R4
R1~R8
$(C_{k+1}F_{k+1}+\cdots+C_nF_n)$
R2
$(C_1^2F_1^2+\cdots+C_{k-1}^2F_{k-1}^2)$
O
$(F_1^1,\cdots,F_k^1,F_1^2,\cdots,F_k^2,$
$F_1^3,\cdots,F_k^3,\cdots,F_{k+1},\cdots,F_n)$
R3
$(C_1^3F_1^3+\cdots+C_k^3F_k^3)$
R6

FIG. 14

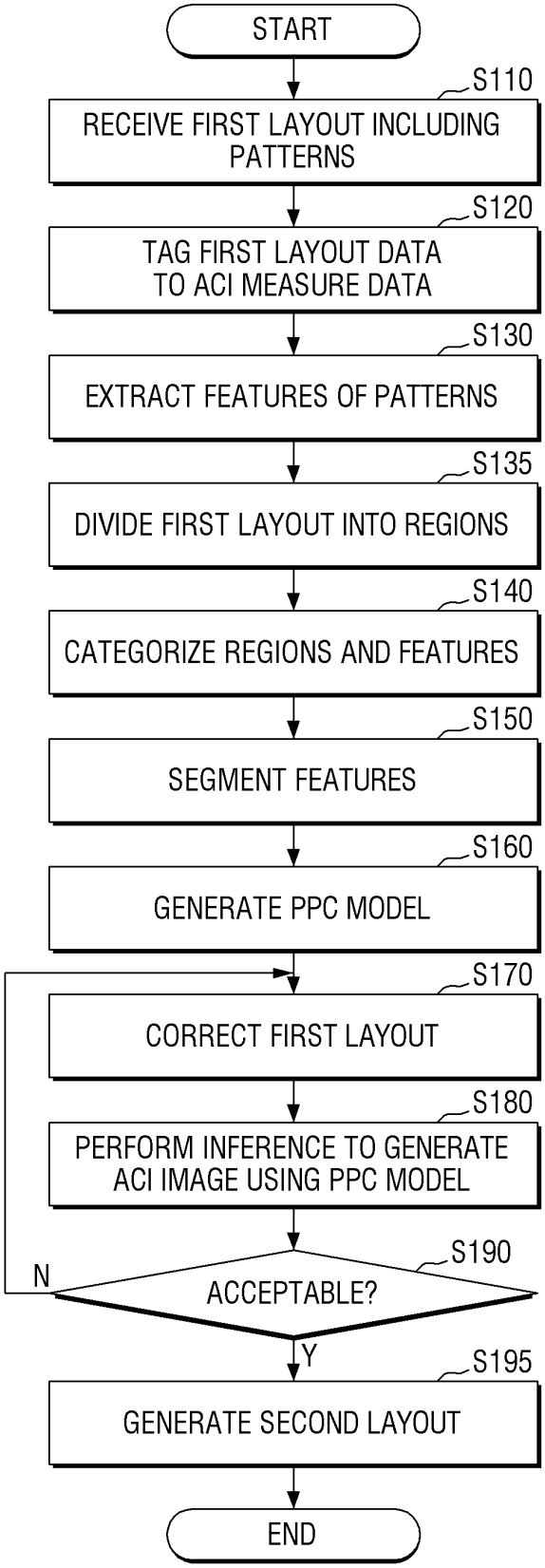
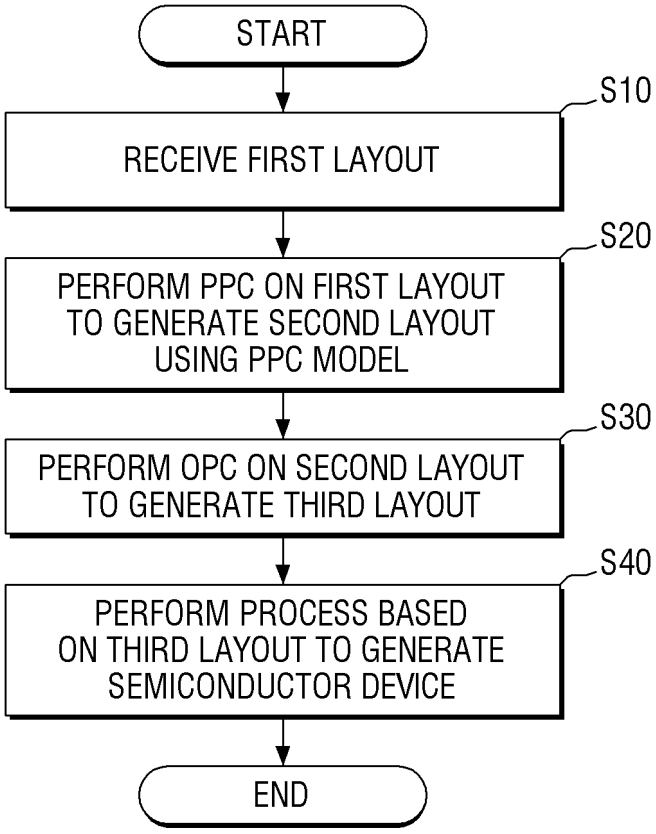

START
S110
RECEIVE FIRST LAYOUT INCLUDING PATTERNS
S120
TAG FIRST LAYOUT DATA TO ACI MEASURE DATA
S130
EXTRACT FEATURES OF PATTERNS
S135
DIVIDE FIRST LAYOUT INTO REGIONS
S140
CATEGORIZE REGIONS AND FEATURES
S150
SEGMENT FEATURES
S160
GENERATE PPC MODEL
S170
CORRECT FIRST LAYOUT
S180
PERFORM INFERENCE TO GENERATE ACI IMAGE USING PPC MODEL
S190
ACCEPTABLE?
N
Y
S195
GENERATE SECOND LAYOUT
END

FIG. 15


START
S10
RECEIVE FIRST LAYOUT
S20
PERFORM PPC ON FIRST LAYOUT TO GENERATE SECOND LAYOUT USING PPC MODEL
S30
PERFORM OPC ON SECOND LAYOUT TO GENERATE THIRD LAYOUT
S40
PERFORM PROCESS BASED ON THIRD LAYOUT TO GENERATE SEMICONDUCTOR DEVICE
END