FIG. 1

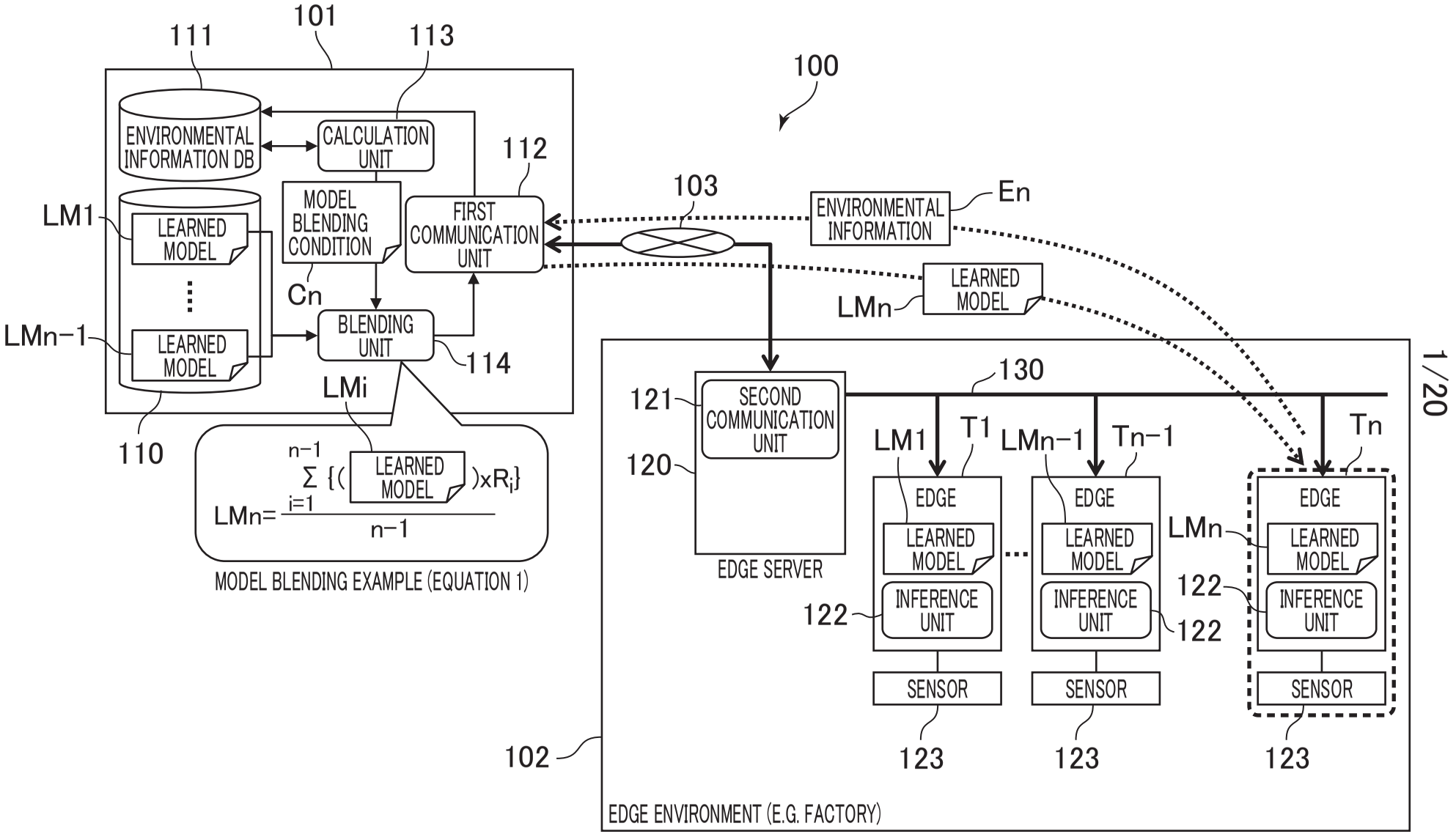

100
101
111
113
112
103
ENVIRONMENTAL INFORMATION DB
CALCULATION UNIT
MODEL BLENDING CONDITION
FIRST COMMUNICATION UNIT
LM1
LEARNED MODEL
LMn−1
LEARNED MODEL
Cn
BLENDING UNIT
114
LMi
110
LMn= Σ {(LEARNED MODEL)xRi} / n−1
MODEL BLENDING EXAMPLE (EQUATION 1)
ENVIRONMENTAL INFORMATION
En
LEARNED MODEL
LMn
1/20
121
SECOND COMMUNICATION UNIT
120
EDGE SERVER
130
LM1
T1
LMn−1
Tn−1
Tn
EDGE
LEARNED MODEL
INFERENCE UNIT
122
SENSOR
123
LMn
102
EDGE ENVIRONMENT (E.G. FACTORY)

FIG. 2

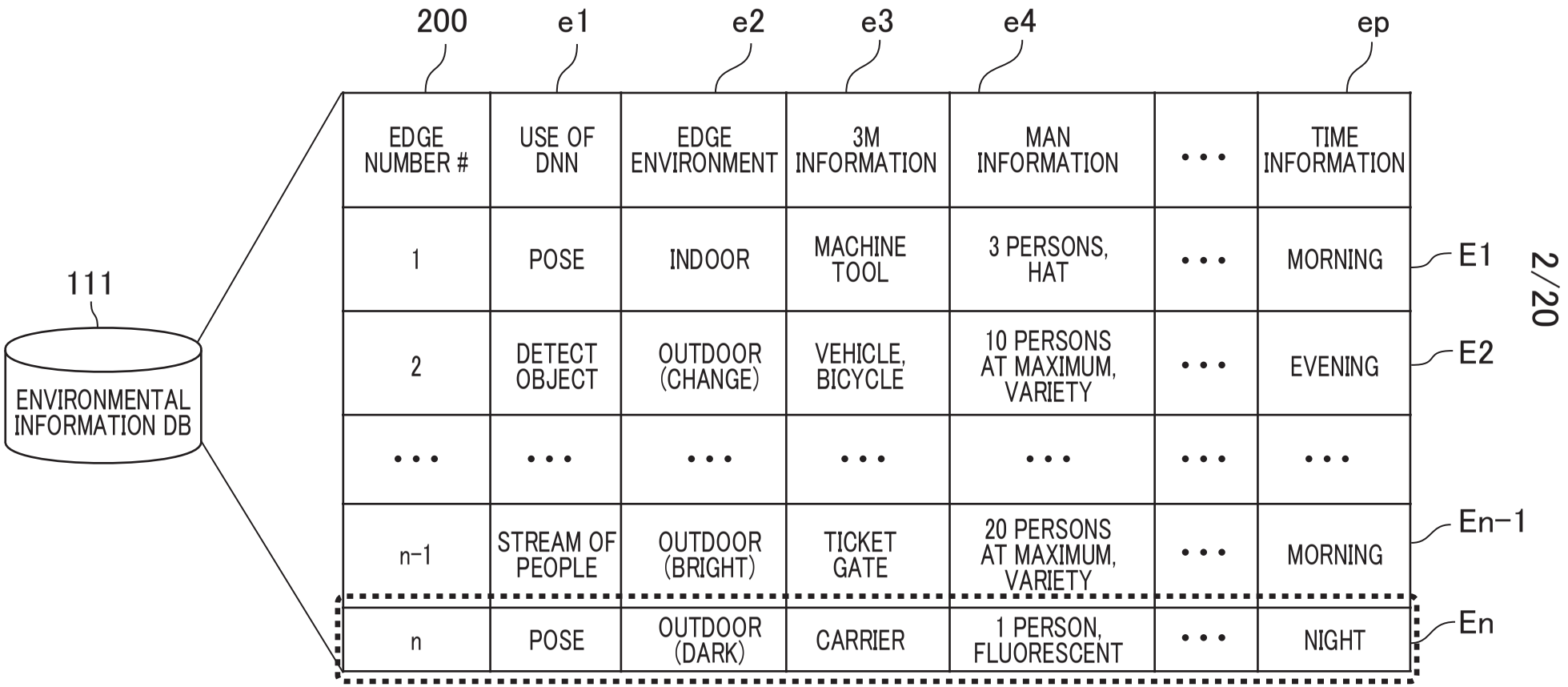

200
e1
e2
e3
e4
ep
111
ENVIRONMENTAL INFORMATION DB
EDGE NUMBER #
USE OF DNN
EDGE ENVIRONMENT
3M INFORMATION
MAN INFORMATION
• • •
TIME INFORMATION
1
POSE
INDOOR
MACHINE TOOL
3 PERSONS, HAT
• • •
MORNING
E1
2
DETECT OBJECT
OUTDOOR (CHANGE)
VEHICLE, BICYCLE
10 PERSONS AT MAXIMUM, VARIETY
• • •
EVENING
E2
• • •
• • •
• • •
• • •
• • •
• • •
• • •
n-1
STREAM OF PEOPLE
OUTDOOR (BRIGHT)
TICKET GATE
20 PERSONS AT MAXIMUM, VARIETY
• • •
MORNING
En-1
n
POSE
OUTDOOR (DARK)
CARRIER
1 PERSON, FLUORESCENT
• • •
NIGHT
En

FIG. 3

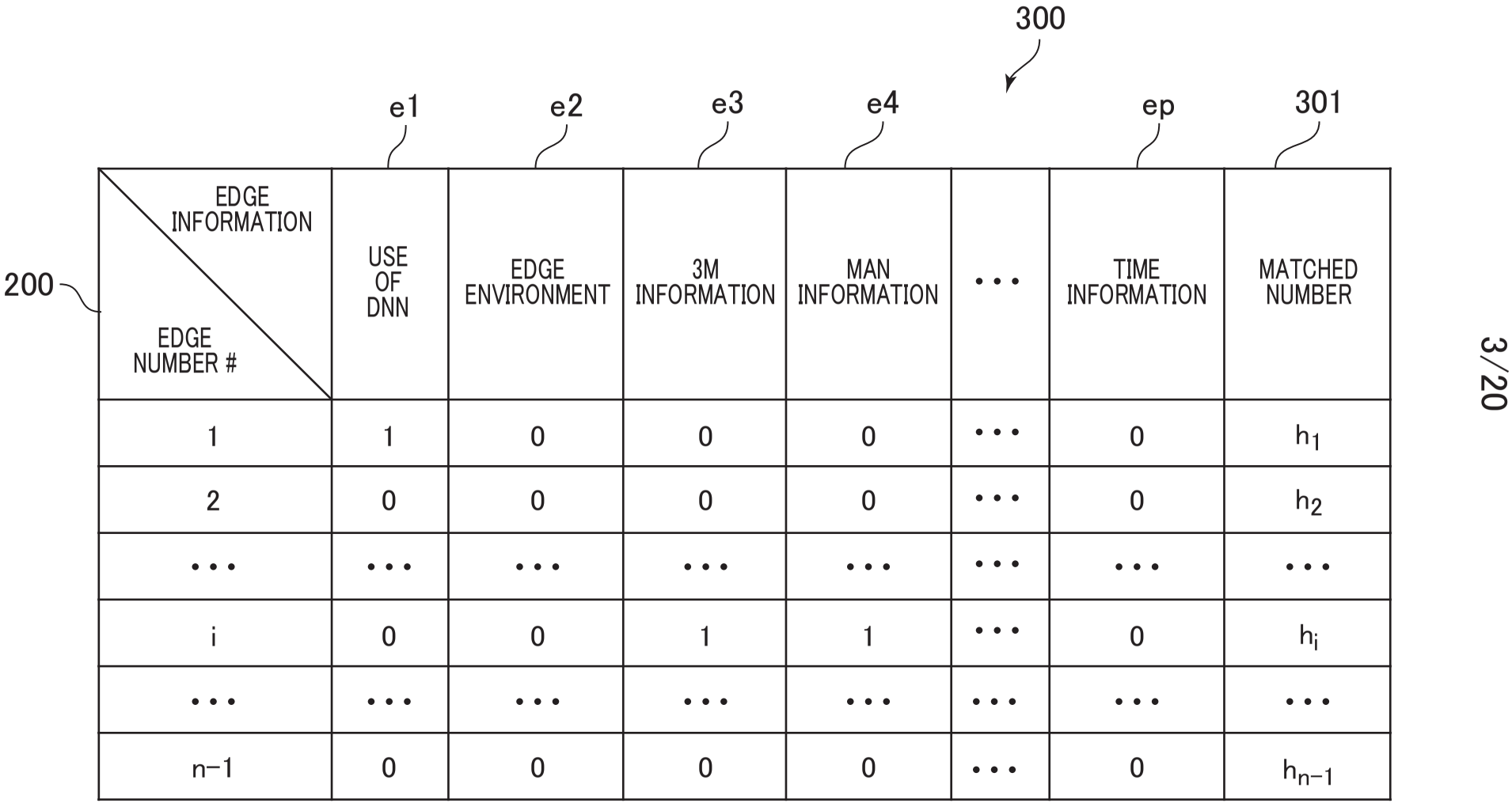

300
e1
e2
e3
e4
ep
301
200
EDGE INFORMATION
EDGE NUMBER #
USE OF DNN
EDGE ENVIRONMENT
3M INFORMATION
MAN INFORMATION
• • •
TIME INFORMATION
MATCHED NUMBER
1 1 0 0 0 • • • 0 h_1
2 0 0 0 0 • • • 0 h_2
• •
i 0 0 1 1 • • • 0 h_i
• •
n−1 0 0 0 0 • • • 0 h_{n-1}

FIG. 4A

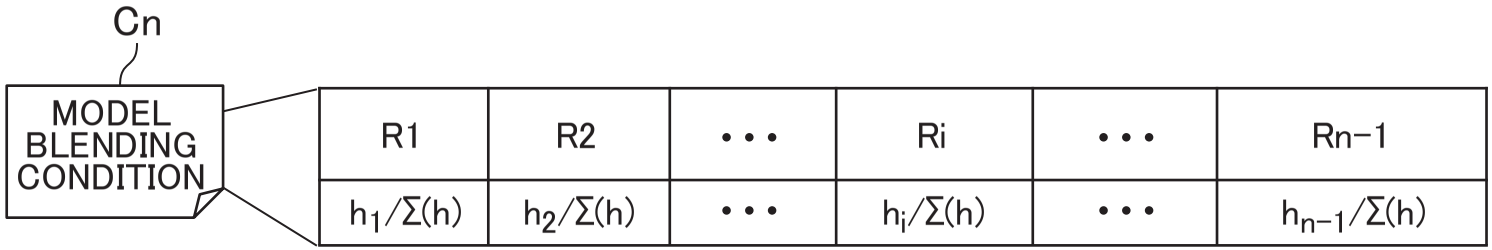


FIG. 4B

$$LMn = \frac{LM1 \times h_1/\Sigma(h) + LM2 \times h_2/\Sigma(h) \cdots + LMi \times h_i/\Sigma(h) \cdots + LMn-1 \times h_{n-1}/\Sigma(h)}{n-1}$$

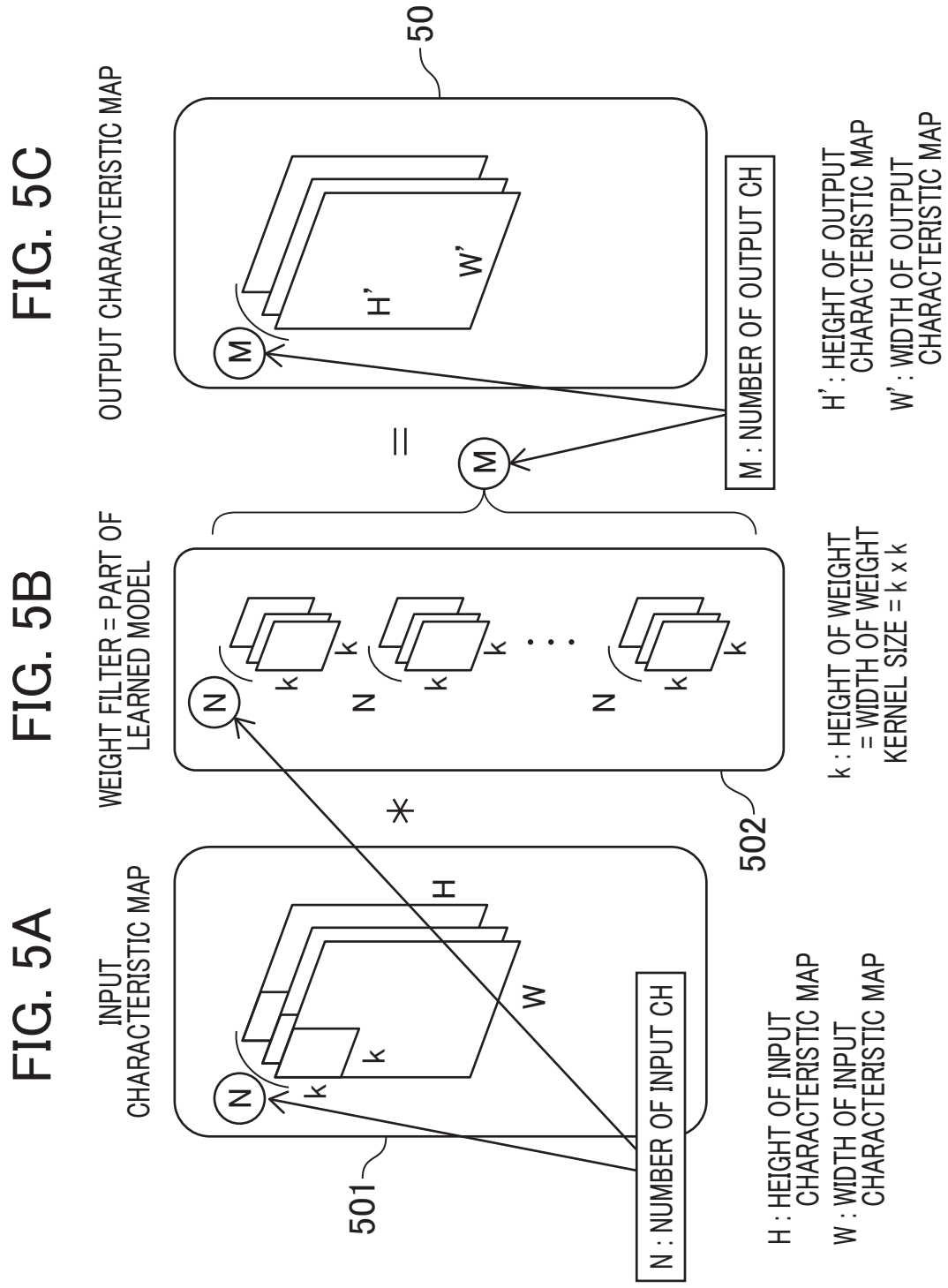

FIG. 5A
INPUT CHARACTERISTIC MAP
H
W
k
N
N : NUMBER OF INPUT CH
501
H : HEIGHT OF INPUT CHARACTERISTIC MAP
W : WIDTH OF INPUT CHARACTERISTIC MAP
FIG. 5B
WEIGHT FILTER = PART OF LEARNED MODEL
N
k
M
502
k : HEIGHT OF WEIGHT = WIDTH OF WEIGHT KERNEL SIZE = k x k
FIG. 5C
OUTPUT CHARACTERISTIC MAP
50
H'
W'
M
M : NUMBER OF OUTPUT CH
H' : HEIGHT OF OUTPUT CHARACTERISTIC MAP
W' : WIDTH OF OUTPUT CHARACTERISTIC MAP

FIG. 6

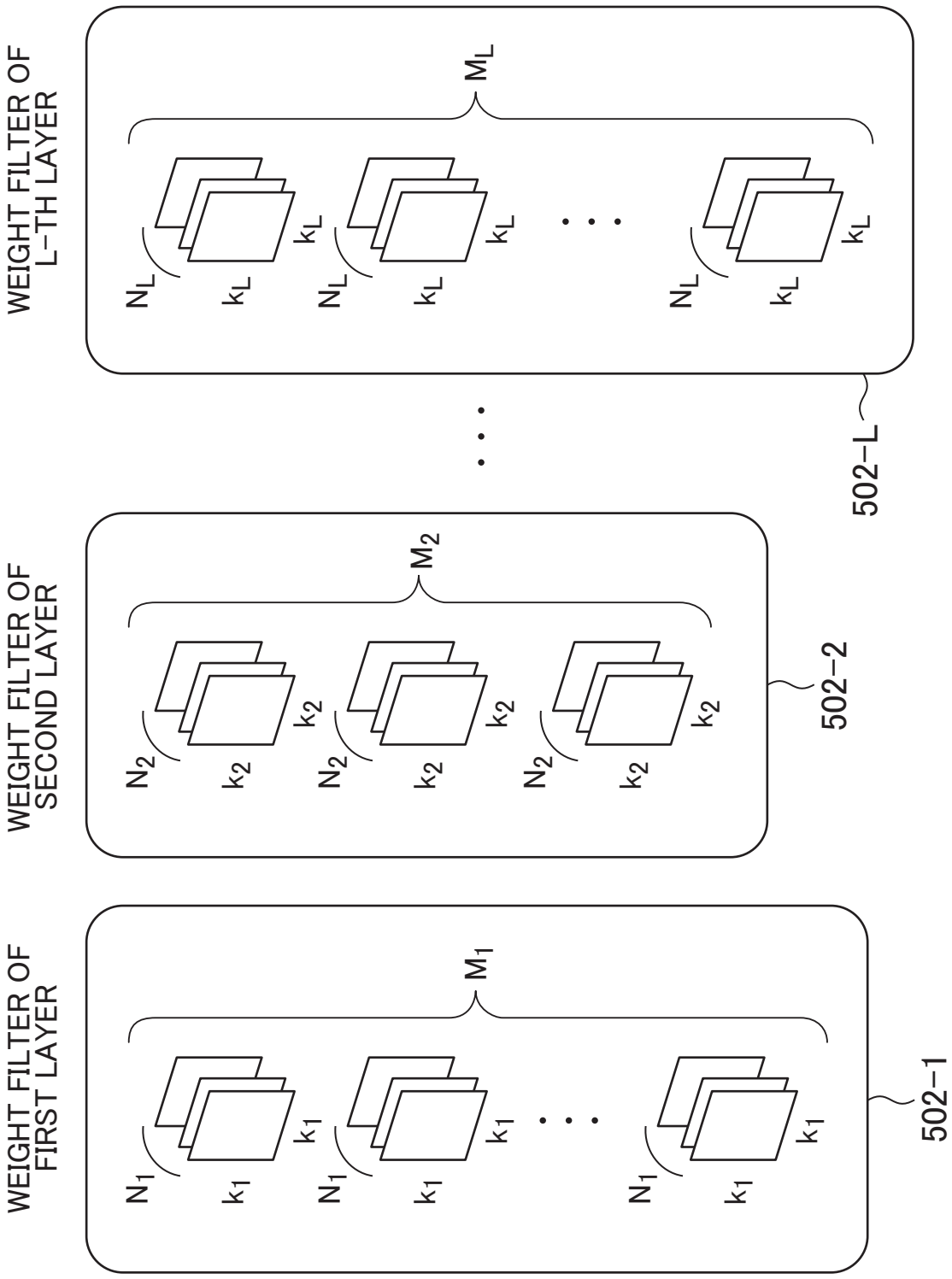

WEIGHT FILTER OF FIRST LAYER
WEIGHT FILTER OF SECOND LAYER
WEIGHT FILTER OF L−TH LAYER
502−1
502−2
502−L
M1
M2
ML
N1
N2
NL
k1
k2
kL

FIG. 7

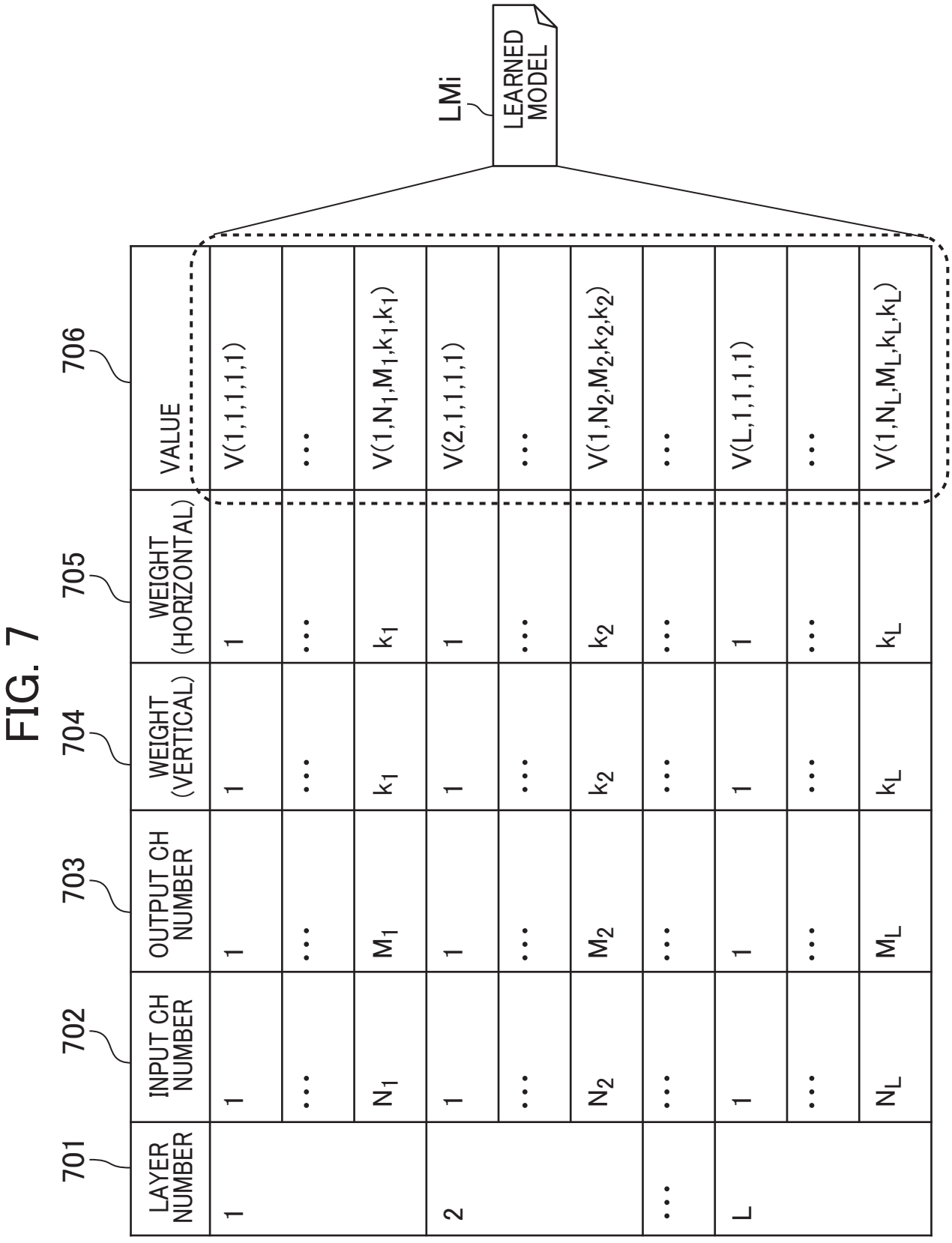

701
LAYER NUMBER
702
INPUT CH NUMBER
703
OUTPUT CH NUMBER
704
WEIGHT (VERTICAL)
705
WEIGHT (HORIZONTAL)
706
VALUE
LMi
LEARNED MODEL
1
2
L
V(1,1,1,1,1)
V(1,N1,M1,k1,k1)
V(2,1,1,1,1)
V(1,N2,M2,k2,k2)
V(L,1,1,1,1)
V(1,NL,ML,kL,kL)

FIG. 8

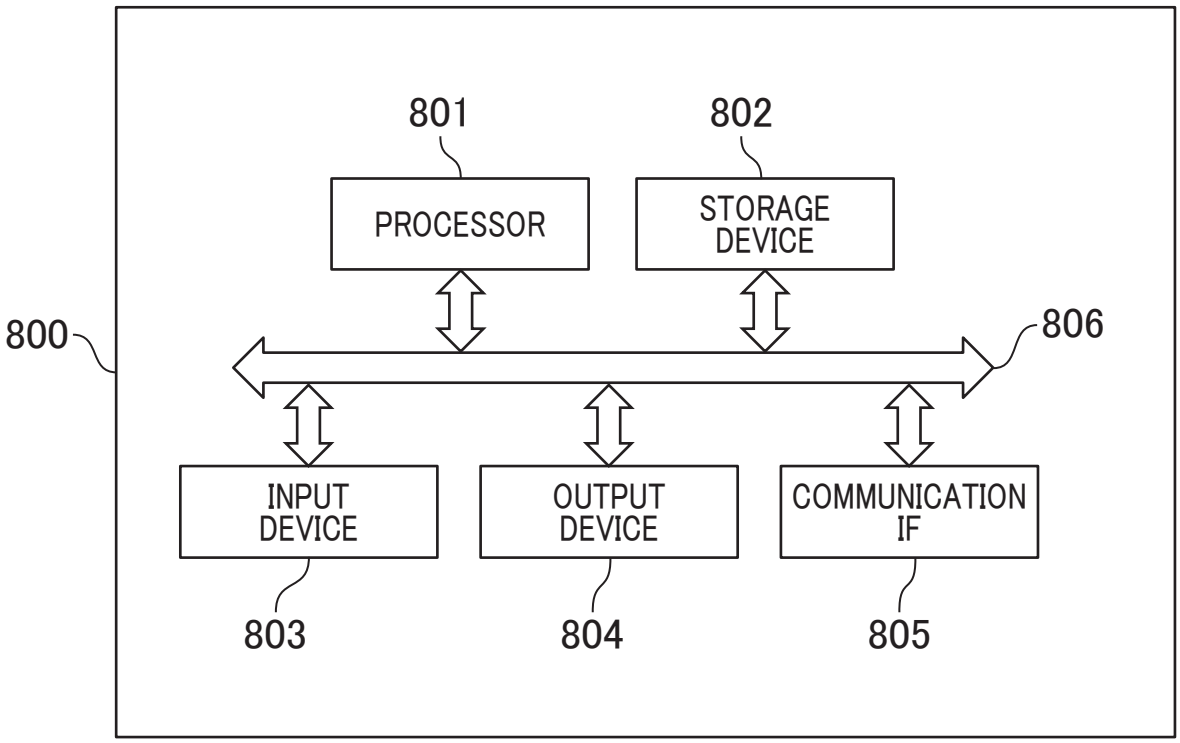

801
802
PROCESSOR
STORAGE DEVICE
800
806
INPUT DEVICE
OUTPUT DEVICE
COMMUNICATION IF
803
804
805

FIG. 9

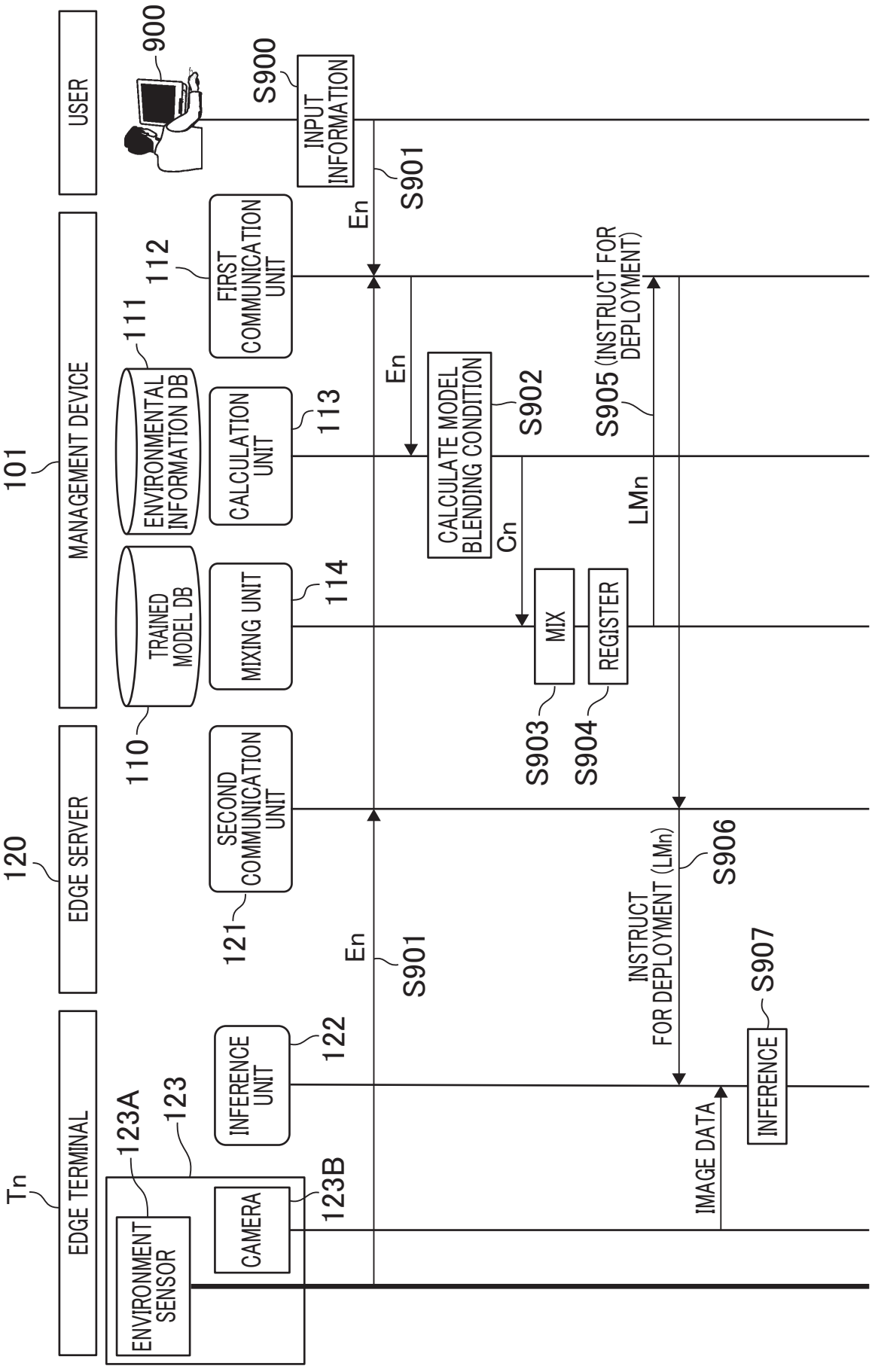

USER
MANAGEMENT DEVICE
EDGE SERVER
EDGE TERMINAL
101
120
Tn
900
S900
INPUT INFORMATION
S901
En
112
FIRST COMMUNICATION UNIT
111
ENVIRONMENTAL INFORMATION DB
113
CALCULATION UNIT
CALCULATE MODEL BLENDING CONDITION
S902
Cn
S905 (INSTRUCT FOR DEPLOYMENT)
LMn
110
TRAINED MODEL DB
114
MIXING UNIT
MIX
REGISTER
S903
S904
121
SECOND COMMUNICATION UNIT
INSTRUCT FOR DEPLOYMENT (LMn)
S906
122
INFERENCE UNIT
123A
123
123B
ENVIRONMENT SENSOR
CAMERA
IMAGE DATA
INFERENCE
S907

FIG. 10

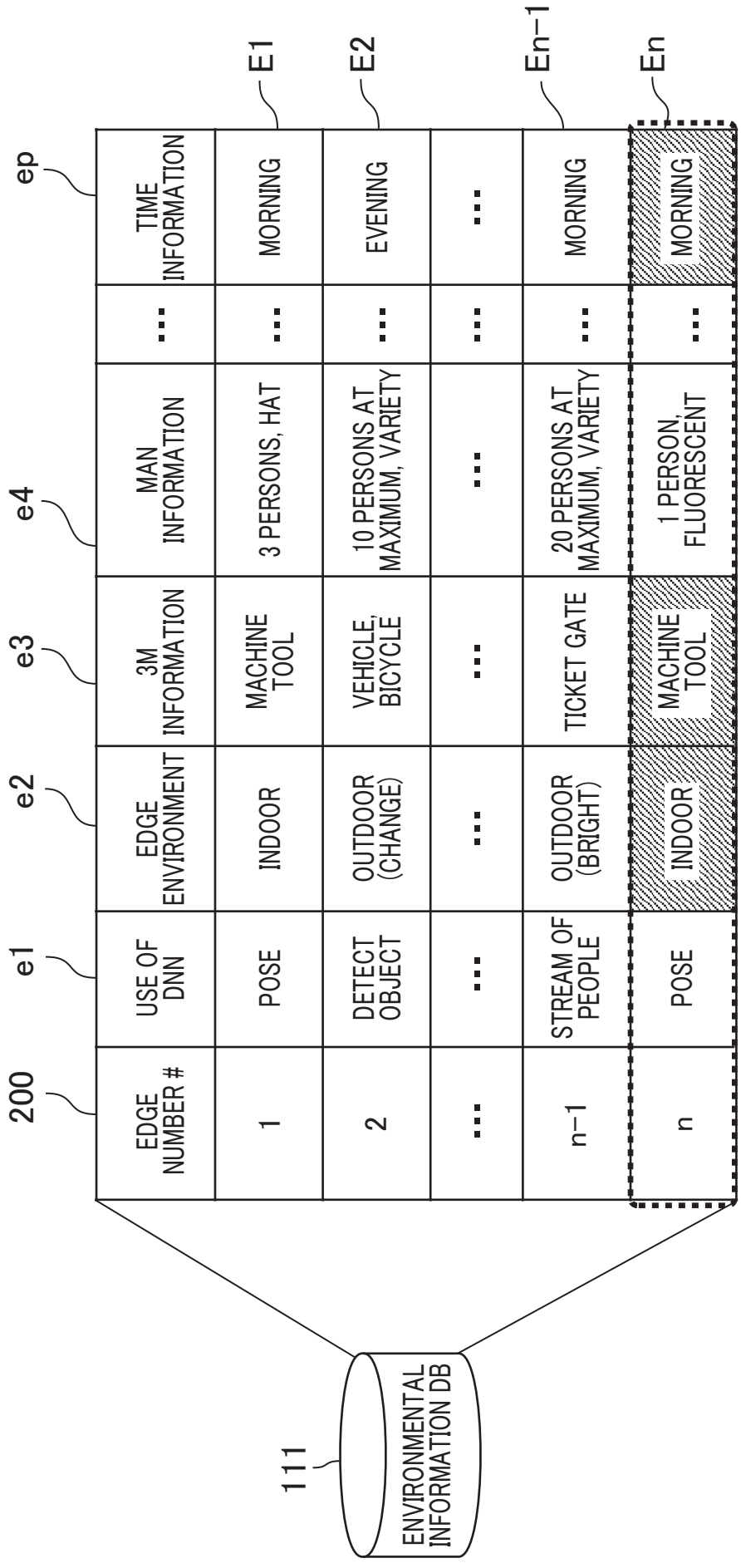

200
e1
e2
e3
e4
ep
E1
E2
En−1
En
EDGE NUMBER #
USE OF DNN
EDGE ENVIRONMENT
3M INFORMATION
MAN INFORMATION
...
TIME INFORMATION
1
POSE
INDOOR
MACHINE TOOL
3 PERSONS, HAT
...
MORNING
2
DETECT OBJECT
OUTDOOR (CHANGE)
VEHICLE, BICYCLE
10 PERSONS AT MAXIMUM, VARIETY
...
EVENING
...
...
...
...
...
...
n−1
STREAM OF PEOPLE
OUTDOOR (BRIGHT)
TICKET GATE
20 PERSONS AT MAXIMUM, VARIETY
...
MORNING
n
POSE
INDOOR
MACHINE TOOL
1 PERSON, FLUORESCENT
...
MORNING
111
ENVIRONMENTAL INFORMATION DB

FIG. 11

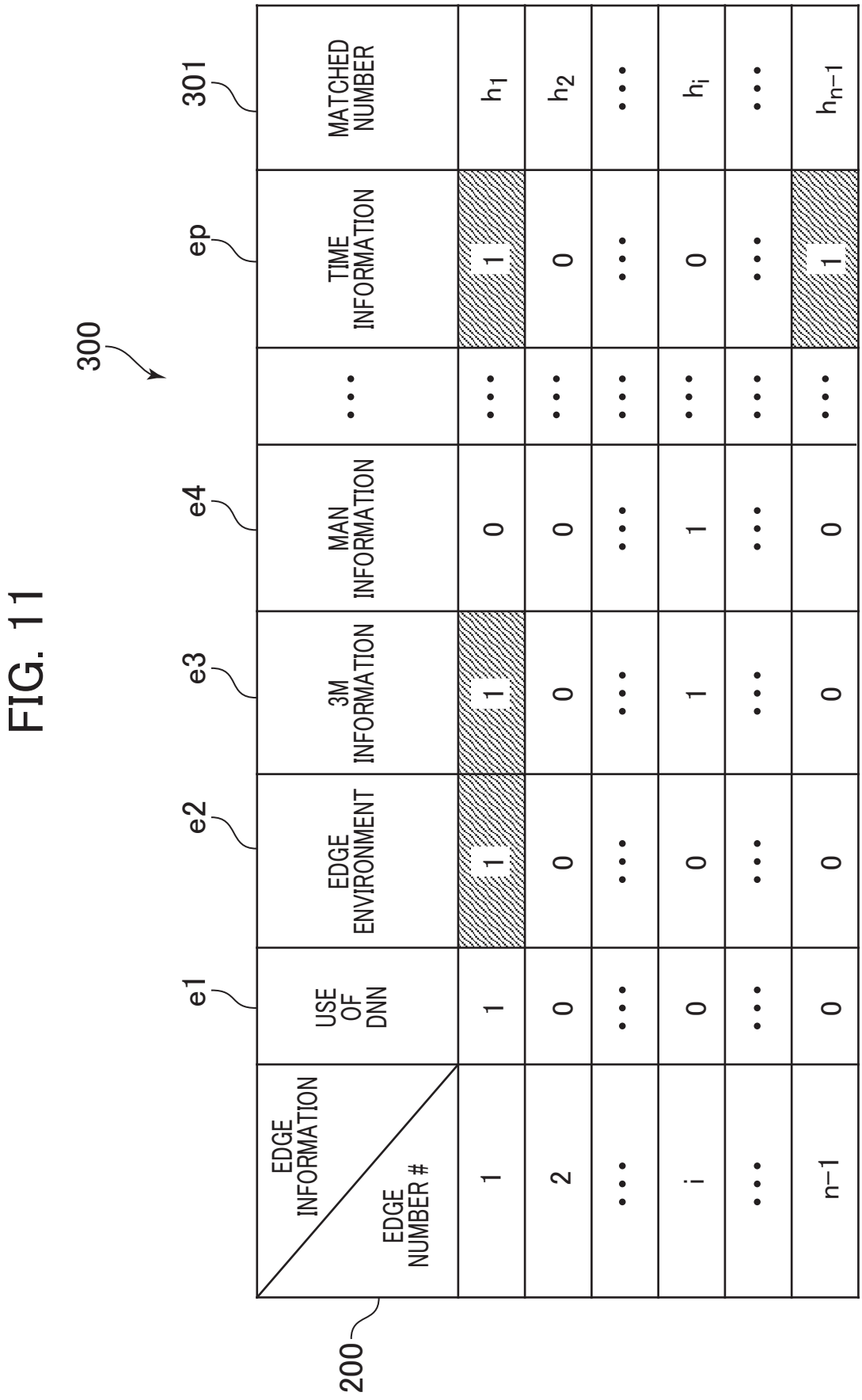

200
300
e1
e2
e3
e4
ep
301
EDGE INFORMATION
EDGE NUMBER #
USE OF DNN
EDGE ENVIRONMENT
3M INFORMATION
MAN INFORMATION
TIME INFORMATION
MATCHED NUMBER
1 1 1 0 1 h1
2 0 0 0 0 h2
i 0 0 1 1 0 hi
n−1 0 0 0 0 1 hn−1

FIG. 12

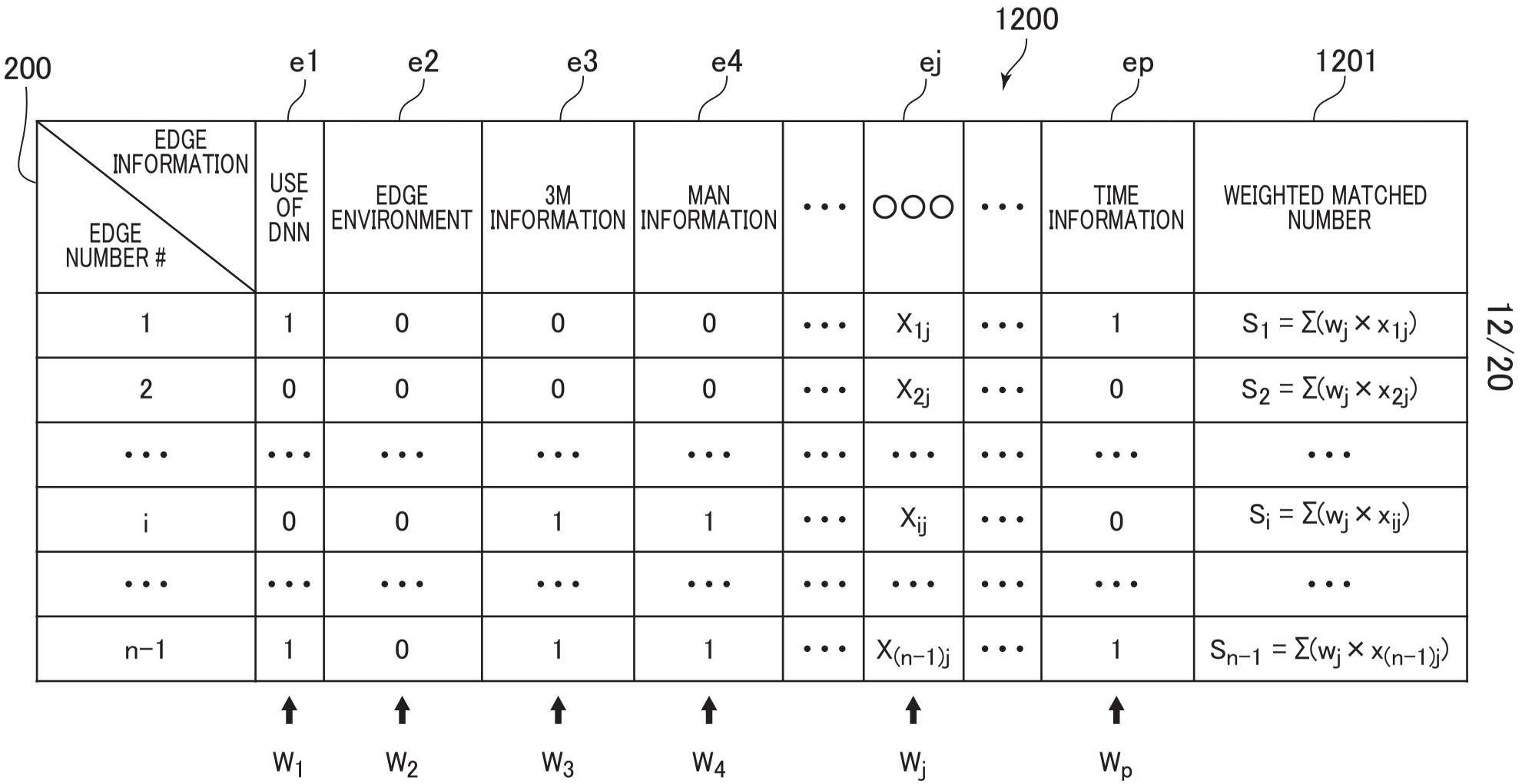

200
1200
1201
e1
e2
e3
e4
ej
ep
EDGE INFORMATION
EDGE NUMBER #
USE OF DNN
EDGE ENVIRONMENT
3M INFORMATION
MAN INFORMATION
○○○
TIME INFORMATION
WEIGHTED MATCHED NUMBER
1 1 0 0 0 X1j 1 S1 = Σ(wj × x1j)
2 0 0 0 0 X2j 0 S2 = Σ(wj × x2j)
i 0 0 1 1 Xij 0 Si = Σ(wj × xij)
n−1 1 0 1 1 X(n−1)j 1 Sn−1 = Σ(wj × x(n−1)j)
W1
W2
W3
W4
Wj
Wp

FIG. 13A

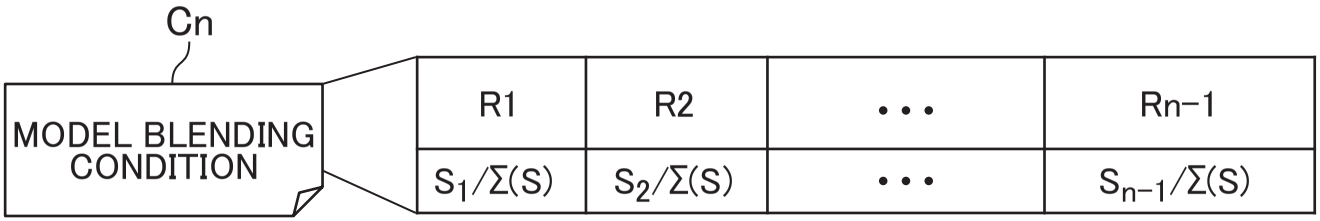


FIG. 13B

$$LMn = \frac{LM1 \times S_1/\Sigma(S) + LM2 \times S_2/\Sigma(S) \cdots + LMi \times S_i/\Sigma(S) \cdots + LMn-1 \times S_{n-1}/\Sigma(S)}{n-1}$$

FIG. 14

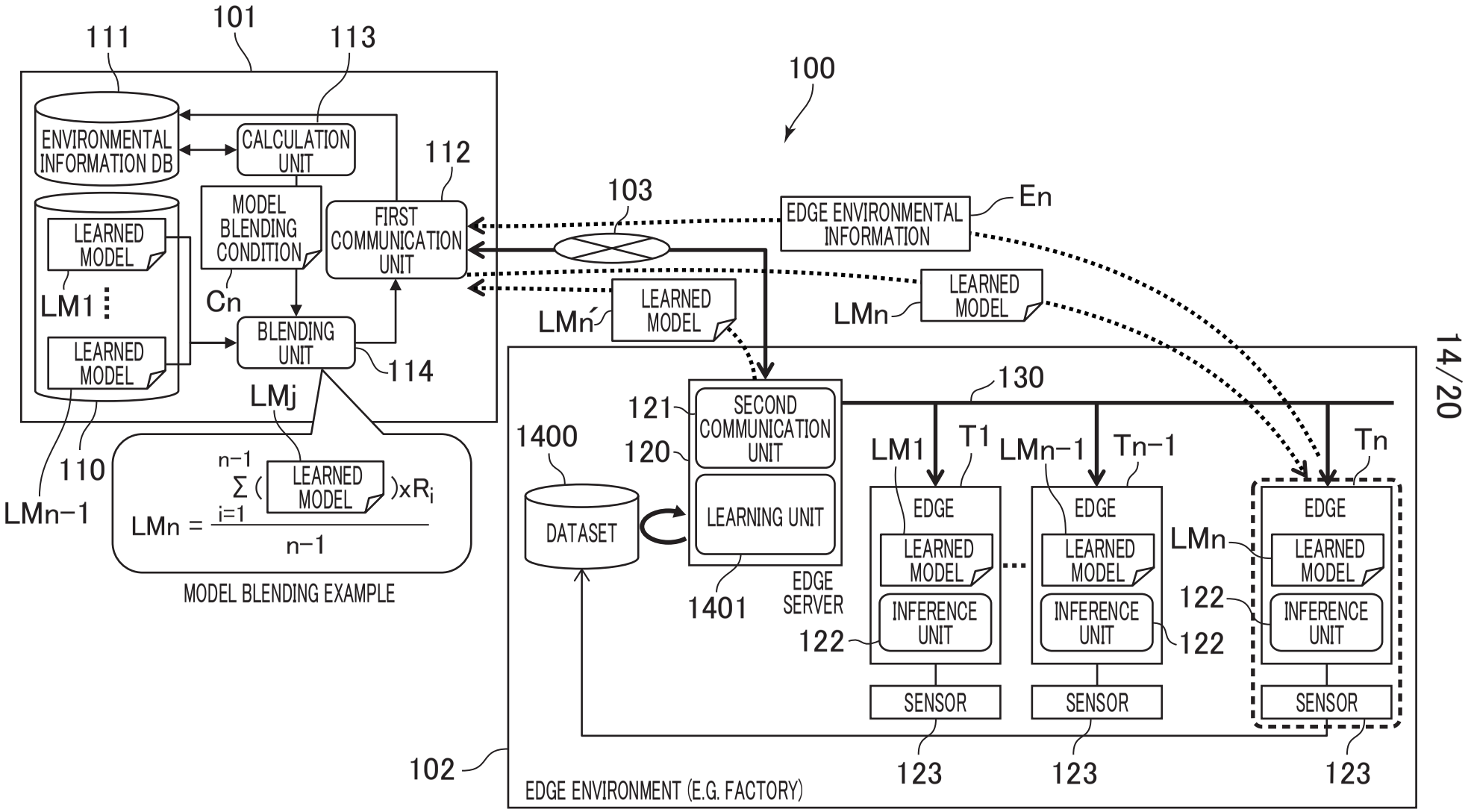

111
101
113
100
ENVIRONMENTAL INFORMATION DB
CALCULATION UNIT
112
103
En
EDGE ENVIRONMENTAL INFORMATION
MODEL BLENDING CONDITION
FIRST COMMUNICATION UNIT
LEARNED MODEL
LM1
Cn
LMn'
LEARNED MODEL
LMn
LEARNED MODEL
BLENDING UNIT
114
LEARNED MODEL
LMj
110
LMn-1
LMn = Σ(LEARNED MODEL)xRi / n-1
MODEL BLENDING EXAMPLE
14/20
130
121
SECOND COMMUNICATION UNIT
120
1400
LM1
T1
LMn-1
Tn-1
Tn
DATASET
LEARNING UNIT
EDGE
LEARNED MODEL
INFERENCE UNIT
LMn
122
1401
EDGE SERVER
SENSOR
102
123
EDGE ENVIRONMENT (E.G. FACTORY)

FIG. 15

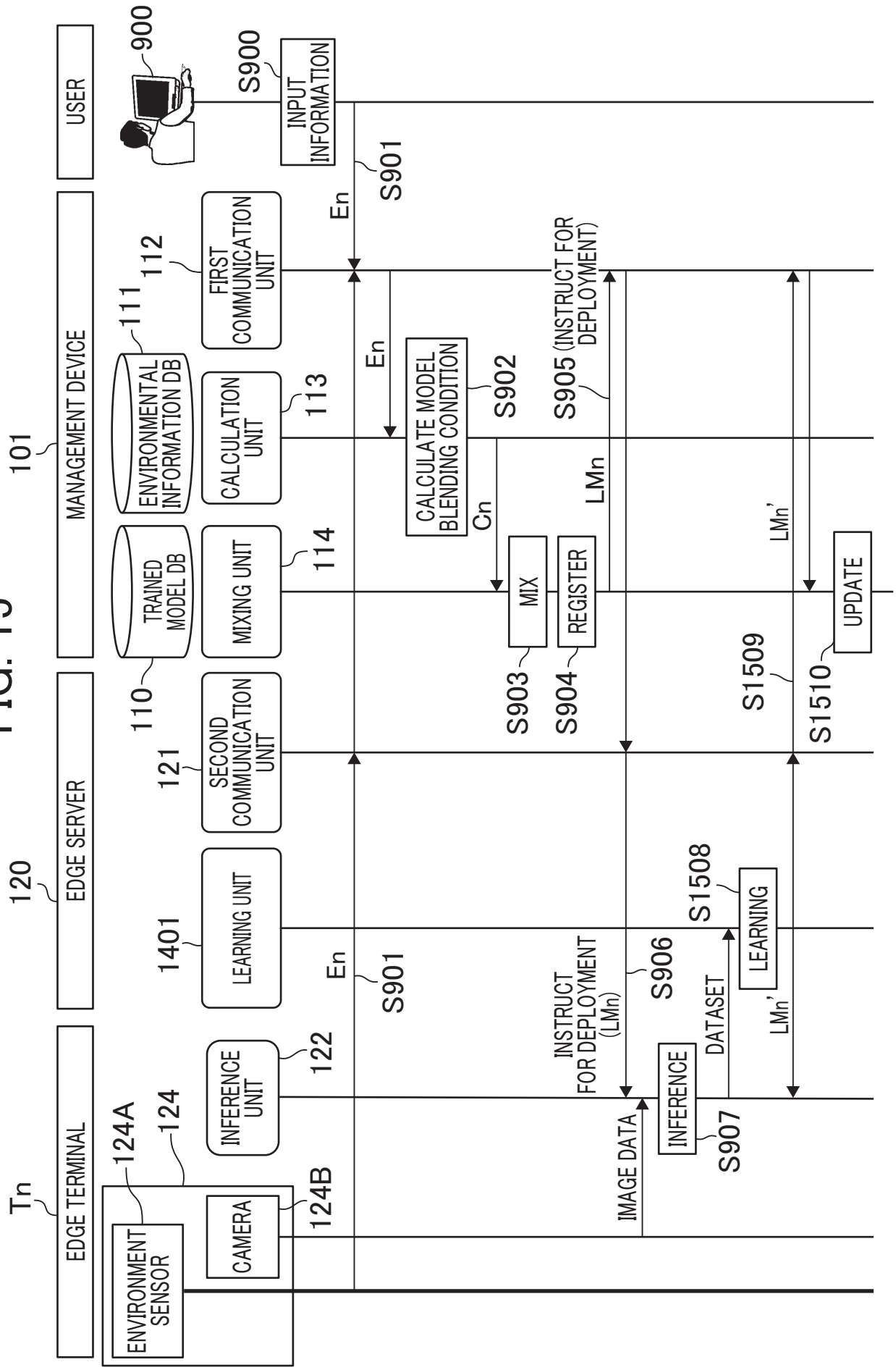

Tn
EDGE TERMINAL
ENVIRONMENT SENSOR
124A
CAMERA
124B
124
INFERENCE UNIT
122
120
EDGE SERVER
1401
LEARNING UNIT
121
SECOND COMMUNICATION UNIT
110
TRAINED MODEL DB
MIXING UNIT
114
101
MANAGEMENT DEVICE
111
ENVIRONMENTAL INFORMATION DB
CALCULATION UNIT
113
112
FIRST COMMUNICATION UNIT
USER
900
S900
INPUT INFORMATION
S901
En
CALCULATE MODEL BLENDING CONDITION
S902
Cn
MIX
S903
REGISTER
S904
LMn
S905 (INSTRUCT FOR DEPLOYMENT)
INSTRUCT FOR DEPLOYMENT (LMn)
S906
IMAGE DATA
INFERENCE
S907
DATASET
S1508
LEARNING
LMn'
S1509
UPDATE
S1510

FIG. 16

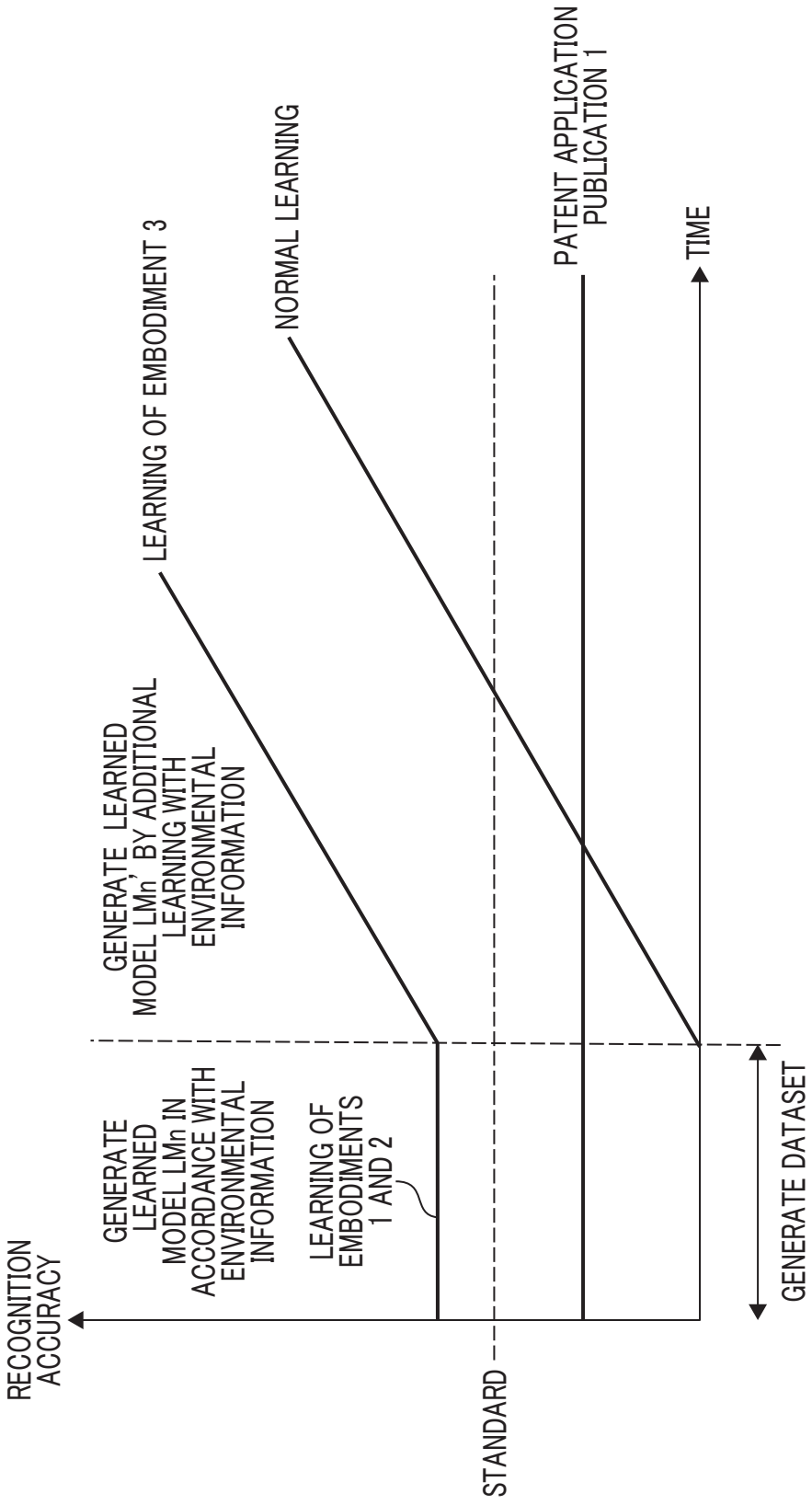

RECOGNITION ACCURACY
GENERATE LEARNED MODEL LMn IN ACCORDANCE WITH ENVIRONMENTAL INFORMATION
LEARNING OF EMBODIMENTS 1 AND 2
GENERATE LEARNED MODEL LMn' BY ADDITIONAL LEARNING WITH ENVIRONMENTAL INFORMATION
LEARNING OF EMBODIMENT 3
NORMAL LEARNING
PATENT APPLICATION PUBLICATION 1
TIME
STANDARD
GENERATE DATASET

FIG. 17

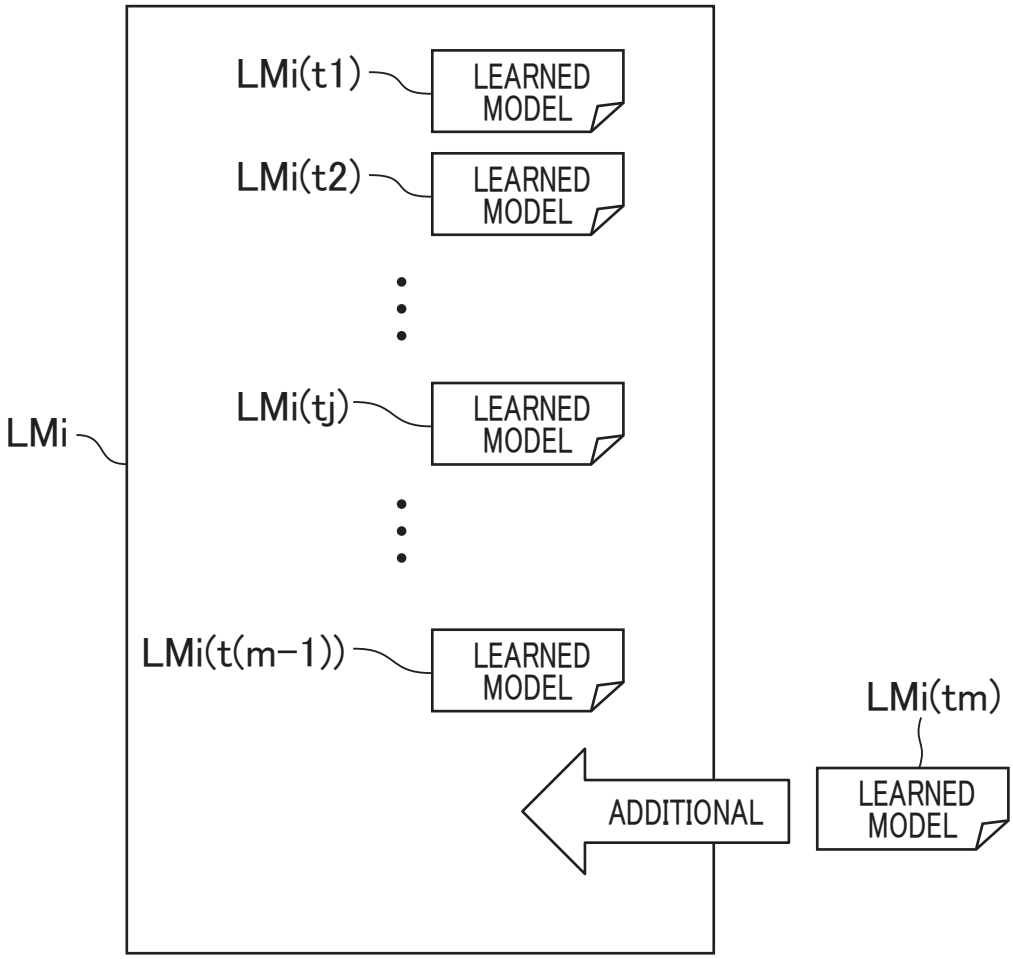

LMi(t1)
LEARNED MODEL
LMi(t2)
LEARNED MODEL
LMi(tj)
LEARNED MODEL
LMi
LMi(t(m-1))
LEARNED MODEL
LMi(tm)
ADDITIONAL
LEARNED MODEL

FIG. 18

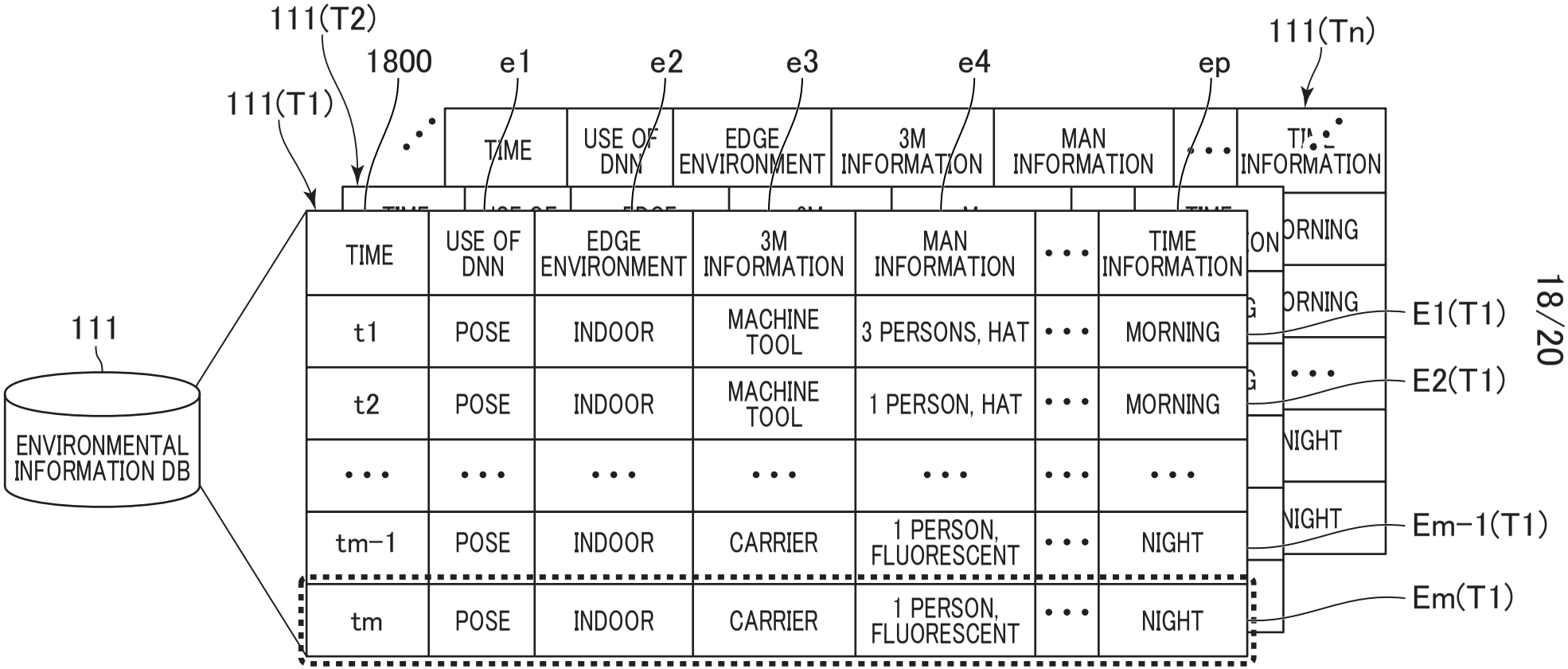

111(T2)
1800
e1
e2
e3
e4
ep
111(Tn)
111(T1)
TIME
USE OF DNN
EDGE ENVIRONMENT
3M INFORMATION
MAN INFORMATION
TIME INFORMATION
111
ENVIRONMENTAL INFORMATION DB
t1
POSE
INDOOR
MACHINE TOOL
3 PERSONS, HAT
MORNING
t2
1 PERSON, HAT
tm-1
CARRIER
1 PERSON, FLUORESCENT
NIGHT
tm
E1(T1)
E2(T1)
Em-1(T1)
Em(T1)

FIG. 19

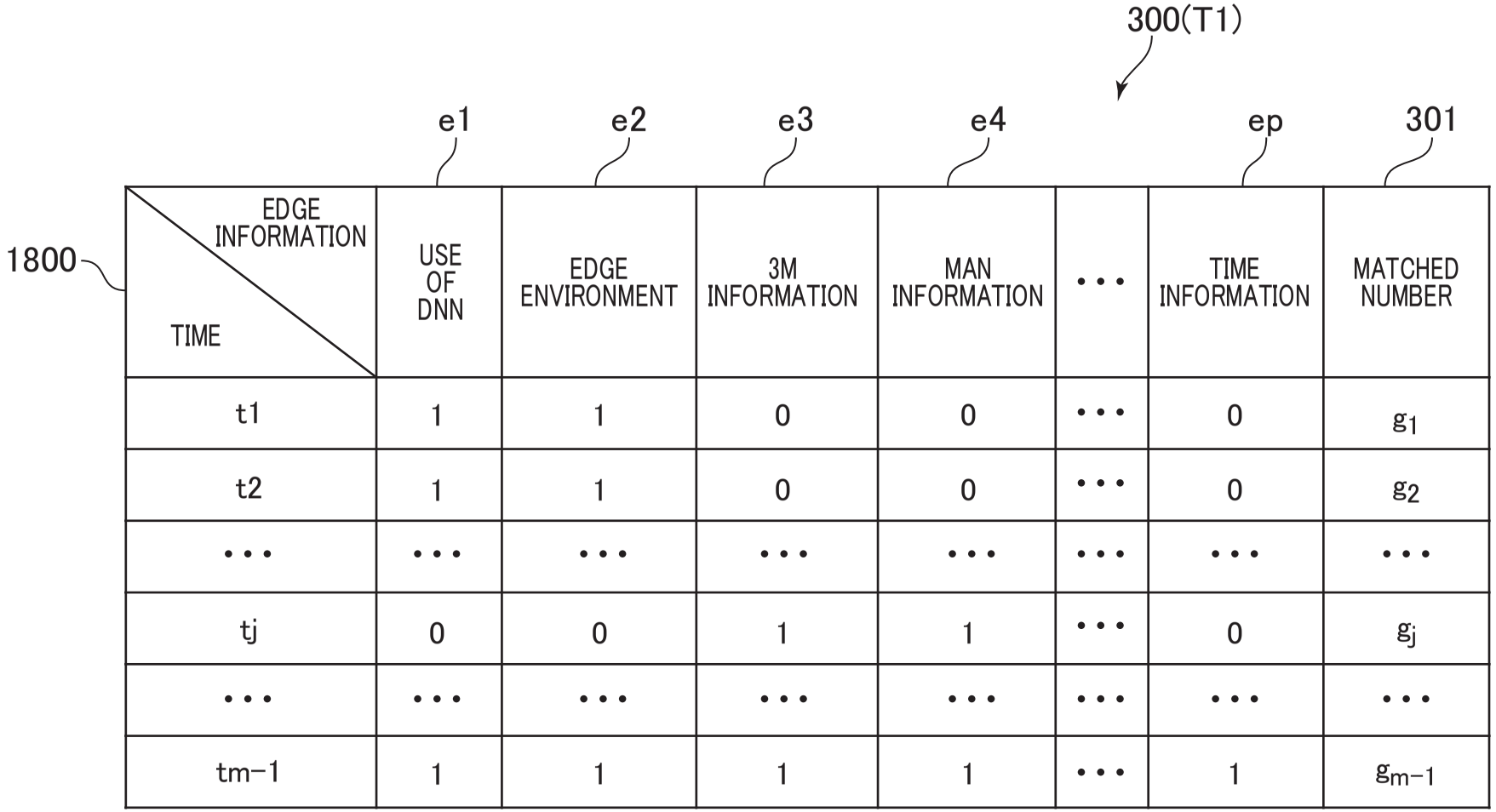

300(T1)
e1
e2
e3
e4
ep
301
1800
EDGE INFORMATION
TIME
USE OF DNN
EDGE ENVIRONMENT
3M INFORMATION
MAN INFORMATION
TIME INFORMATION
MATCHED NUMBER
t1 1 1 0 0 0 g1
t2 1 1 0 0 0 g2
tj 0 0 1 1 0 gj
tm-1 1 1 1 1 1 gm-1

FIG. 20A

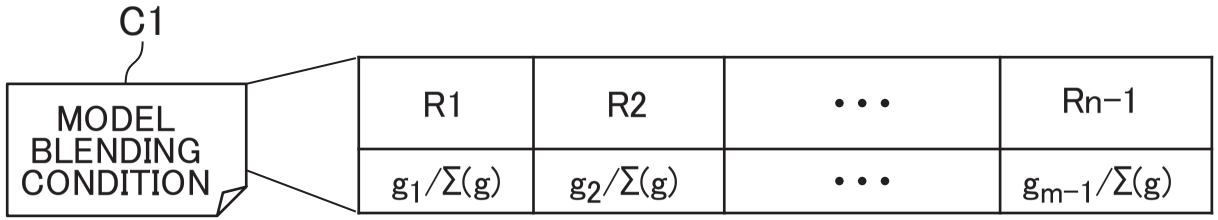


FIG. 20B

$$LM1 = \frac{LM1(t1)1 \times g_1/\Sigma(g) + Lm1(t2) \times g_2/\Sigma(g) \cdots + Lm1(tj) \times g_i/\Sigma(g) \cdots + Lm1(tm-1) \times g_{n-1}/\Sigma(g)}{n-1}$$