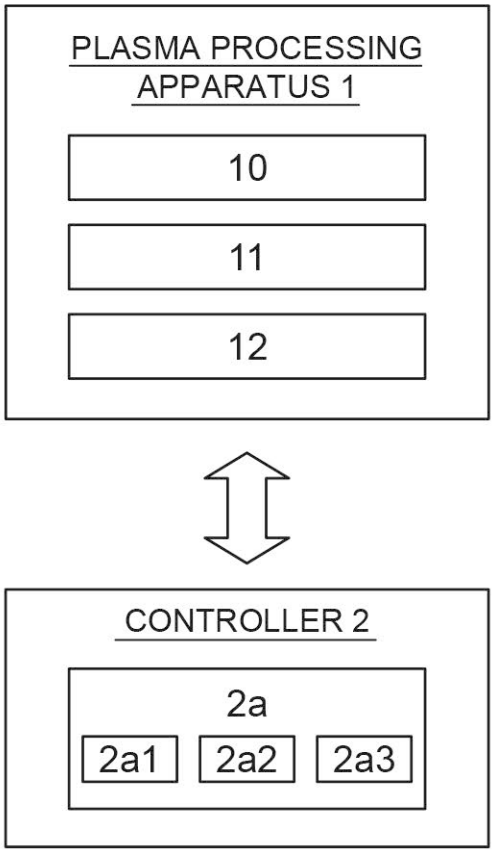
Fig.1


PLASMA PROCESSING APPARATUS 1
10
11
12
CONTROLLER 2
2a
2a1
2a2
2a3

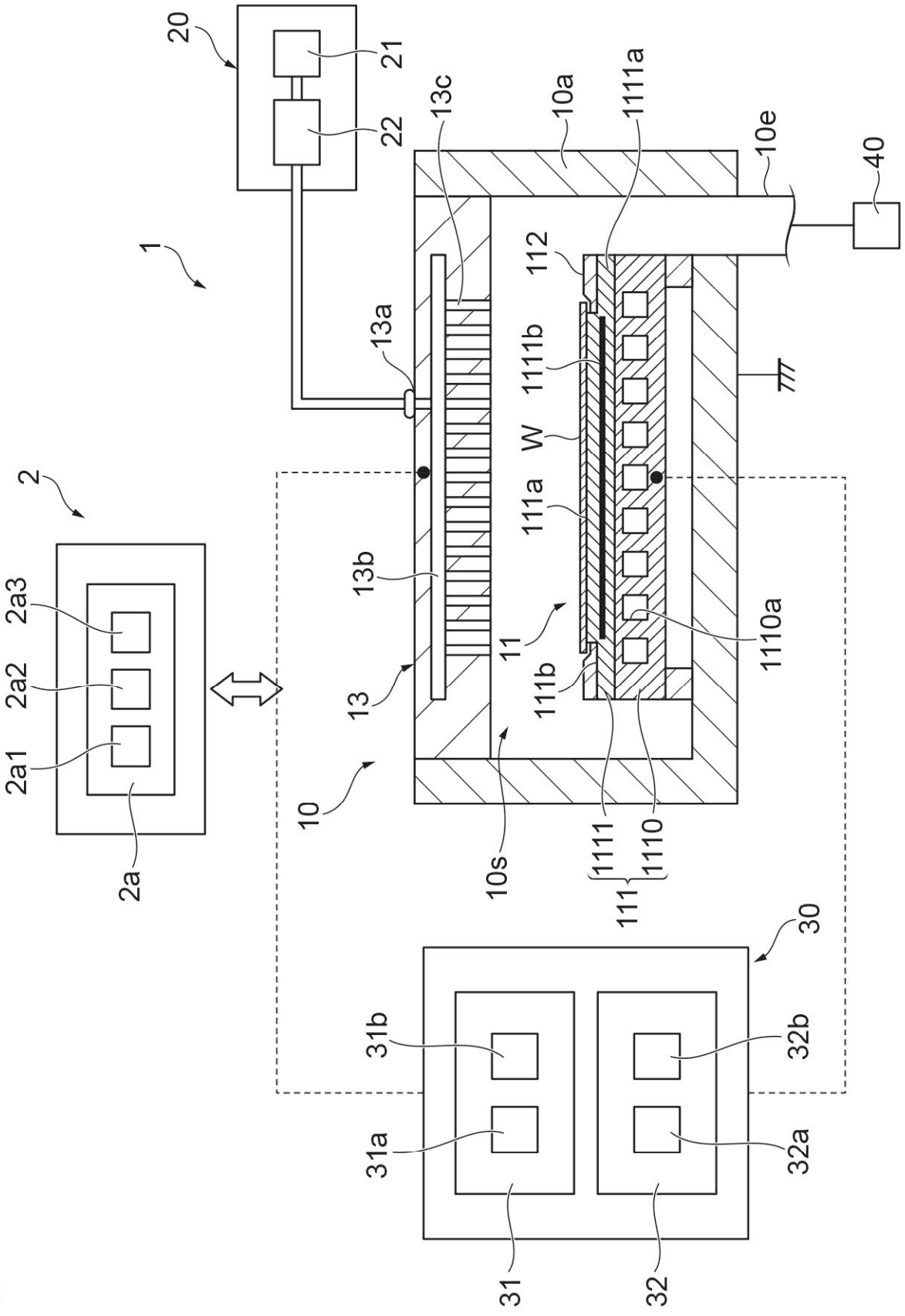
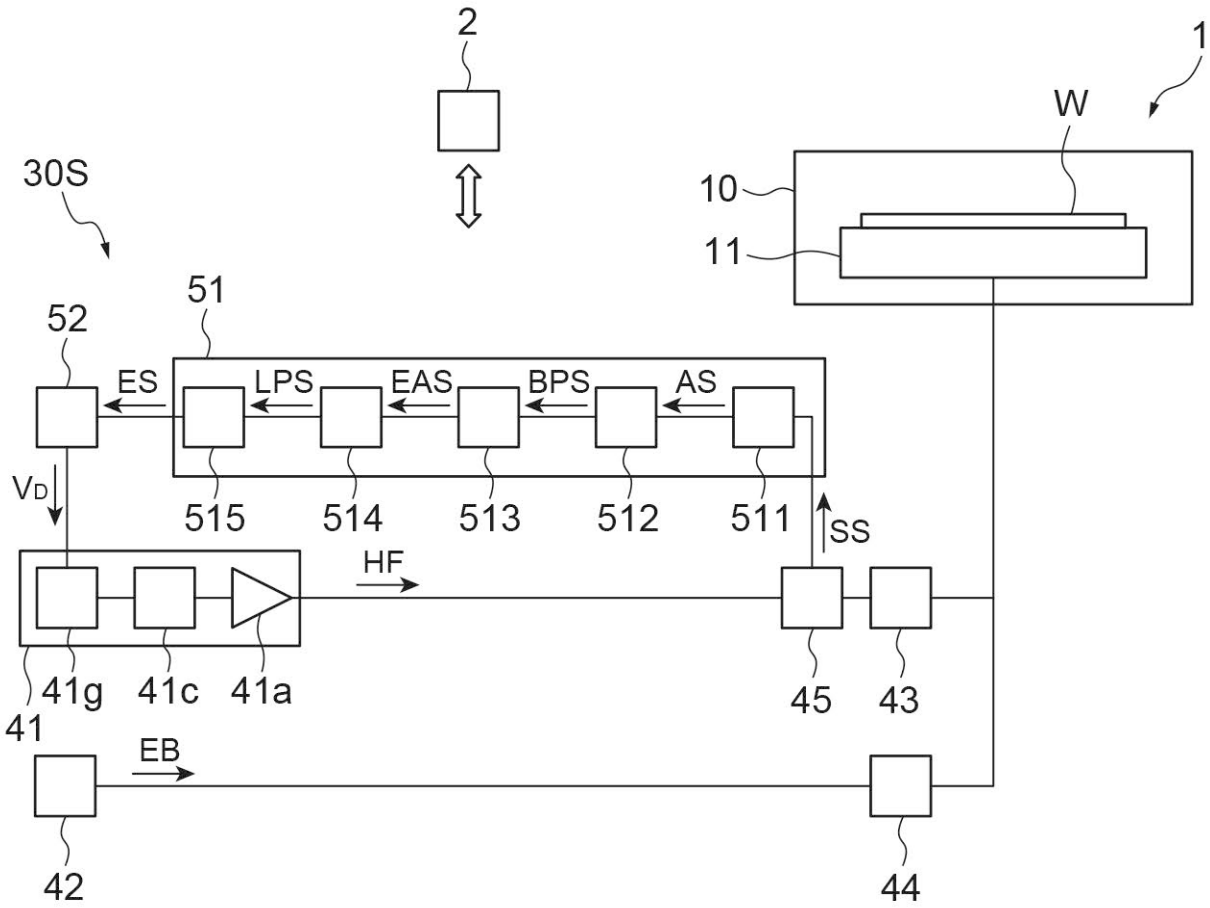

20
21
22
13c
10a
1111a
10e
40
1
112
13a
1111b
W
111a
13b
11
1110a
13
111b
10
10s
1111
1110
111
2
2a3
2a2
2a1
2a
30
31b
32b
31a
32a
31
32

Fig.2

Fig.3


2
1
W
30S
10
11
51
52
ES
LPS
EAS
BPS
AS
V_D
515
514
513
512
511
SS
HF
41g
41c
41a
41
45
43
EB
42
44

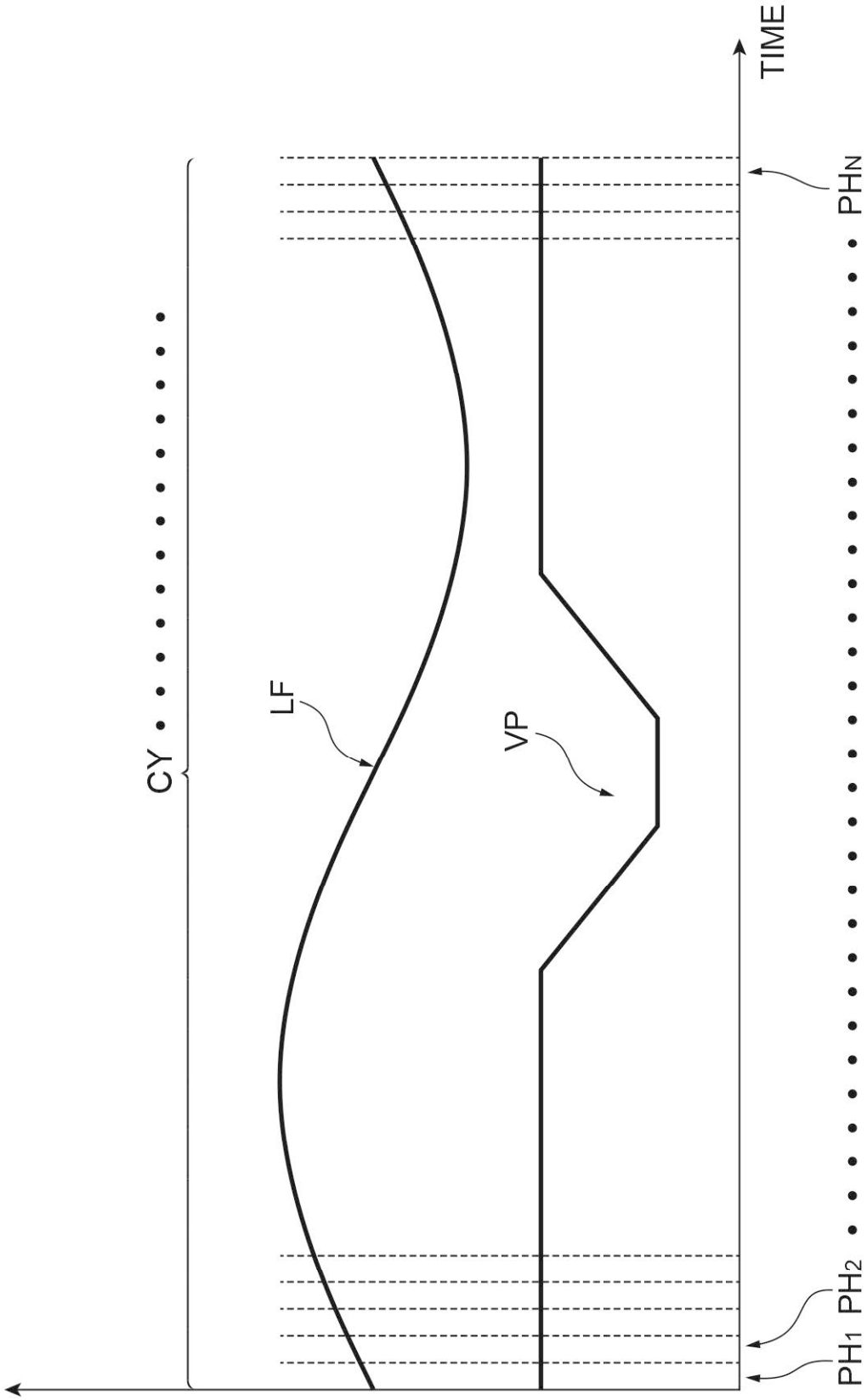


Fig.4

Fig.5

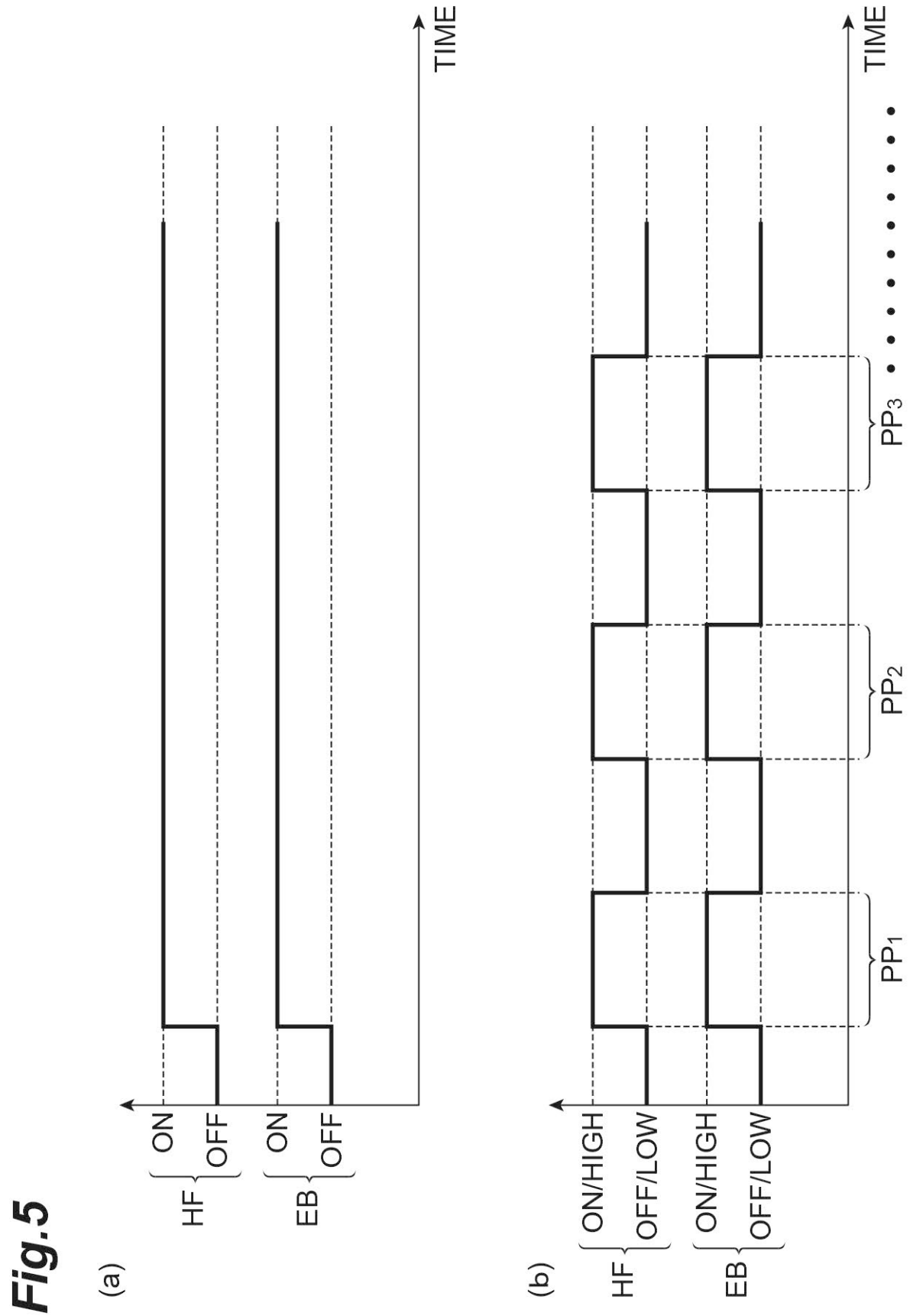

(a)
HF
ON
OFF
EB
ON
OFF
TIME
(b)
HF
ON/HIGH
OFF/LOW
EB
ON/HIGH
OFF/LOW
PP1
PP2
PP3
TIME

Fig.6

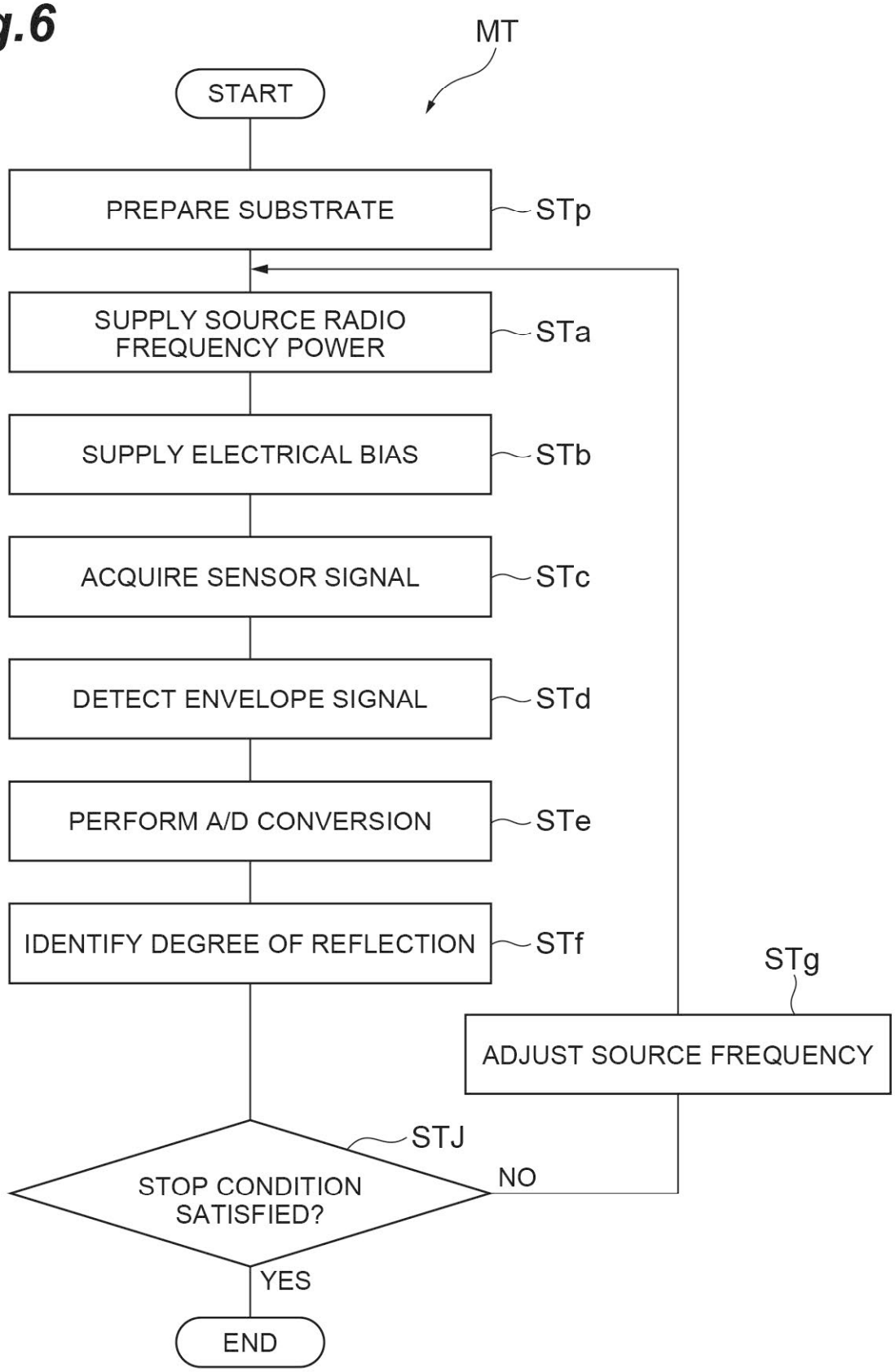

MT
START
PREPARE SUBSTRATE
STp
SUPPLY SOURCE RADIO FREQUENCY POWER
STa
SUPPLY ELECTRICAL BIAS
STb
ACQUIRE SENSOR SIGNAL
STc
DETECT ENVELOPE SIGNAL
STd
PERFORM A/D CONVERSION
STe
IDENTIFY DEGREE OF REFLECTION
STf
STg
ADJUST SOURCE FREQUENCY
STJ
STOP CONDITION SATISFIED?
NO
YES
END

Fig.7

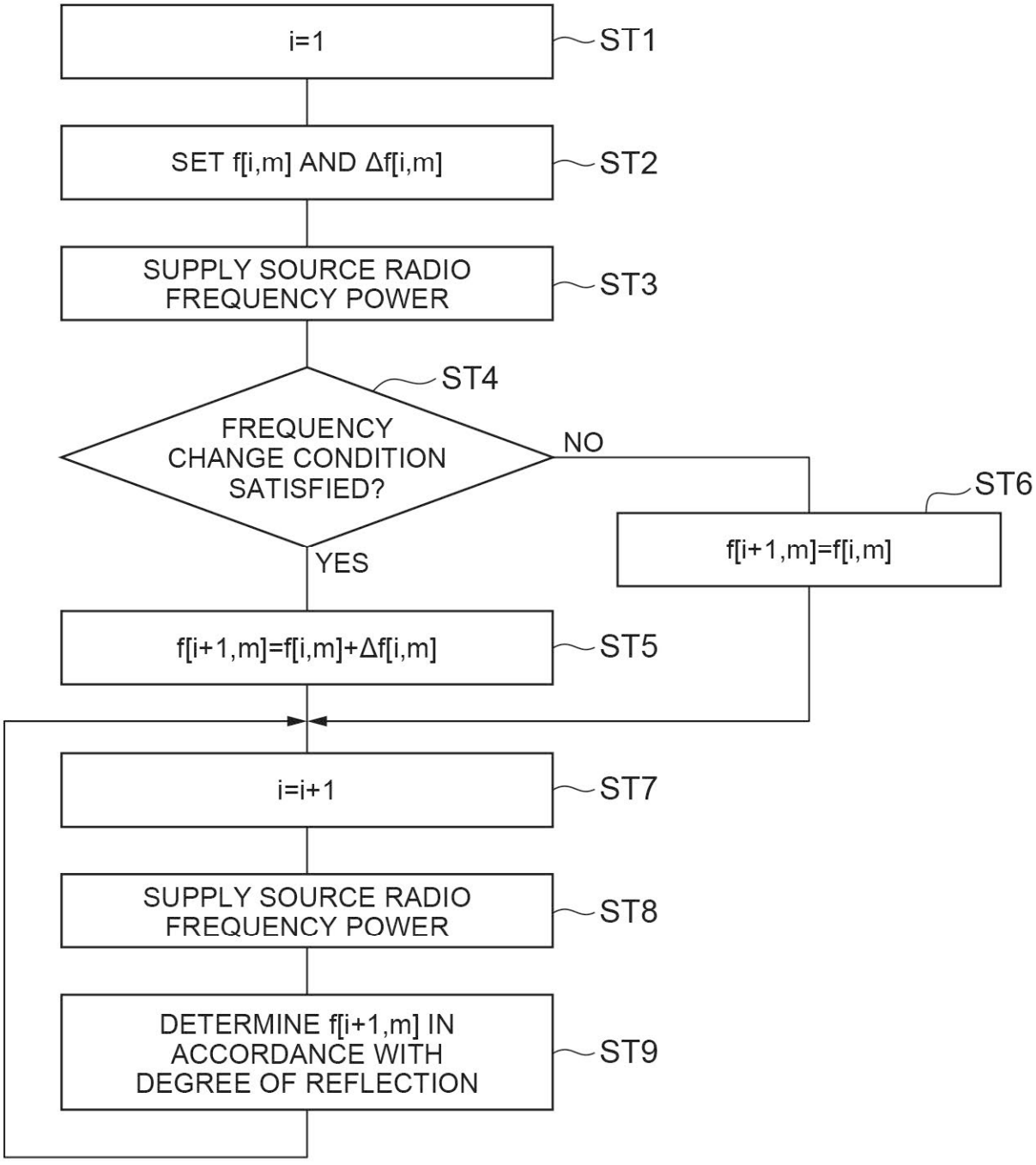

i=1
ST1
SET f[i,m] AND Δf[i,m]
ST2
SUPPLY SOURCE RADIO FREQUENCY POWER
ST3
ST4
FREQUENCY CHANGE CONDITION SATISFIED?
NO
YES
ST6
f[i+1,m]=f[i,m]
f[i+1,m]=f[i,m]+Δf[i,m]
ST5
i=i+1
ST7
SUPPLY SOURCE RADIO FREQUENCY POWER
ST8
DETERMINE f[i+1,m] IN ACCORDANCE WITH DEGREE OF REFLECTION
ST9

Fig.8

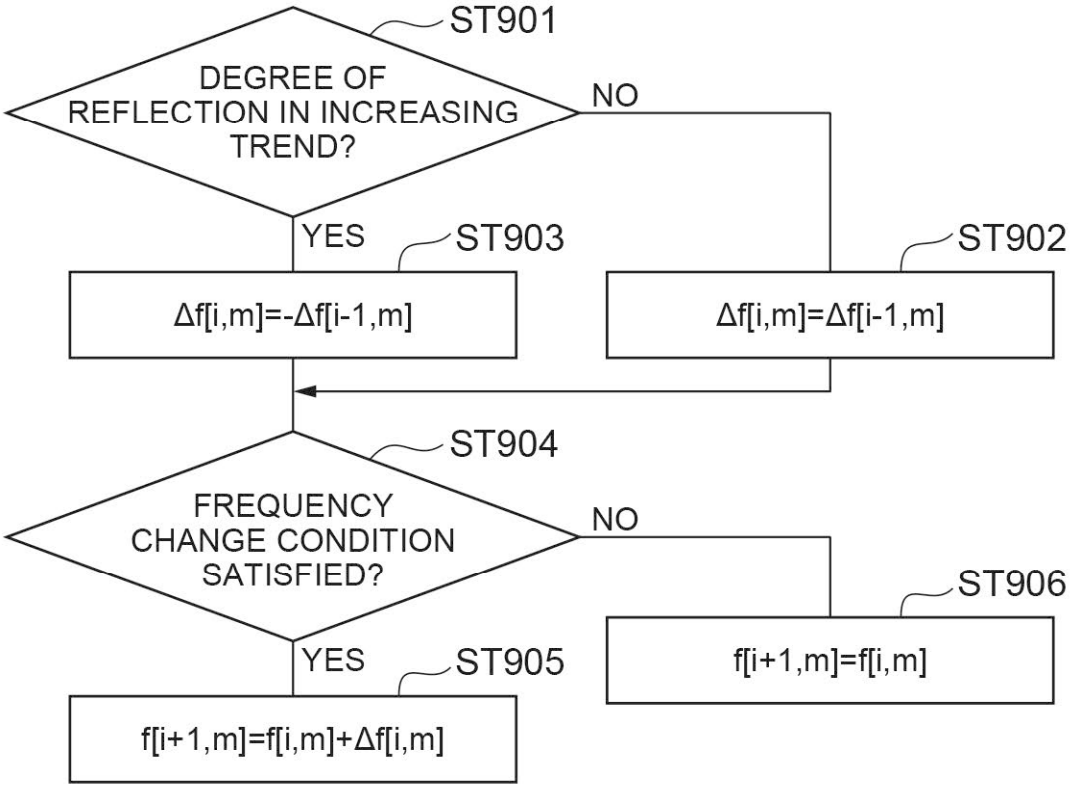

ST901
DEGREE OF REFLECTION IN INCREASING TREND?
NO
YES
ST903
Δf[i,m]=-Δf[i-1,m]
ST902
Δf[i,m]=Δf[i-1,m]
ST904
FREQUENCY CHANGE CONDITION SATISFIED?
NO
YES
ST905
f[i+1,m]=f[i,m]+Δf[i,m]
ST906
f[i+1,m]=f[i,m]

Fig.9

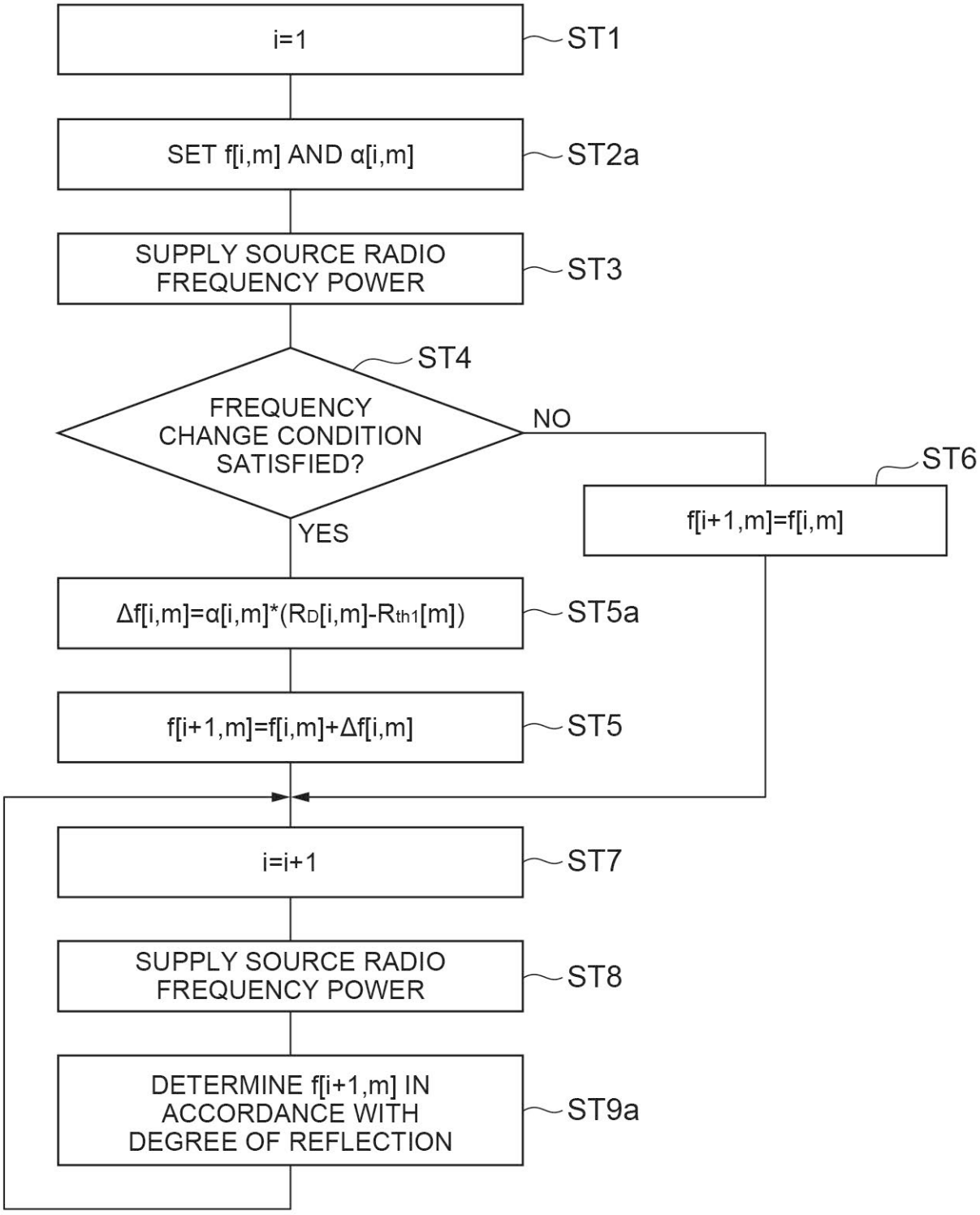

i=1
ST1
SET f[i,m] AND α[i,m]
ST2a
SUPPLY SOURCE RADIO FREQUENCY POWER
ST3
ST4
FREQUENCY CHANGE CONDITION SATISFIED?
NO
YES
ST6
f[i+1,m]=f[i,m]
Δf[i,m]=α[i,m]*(RD[i,m]-Rth1[m])
ST5a
f[i+1,m]=f[i,m]+Δf[i,m]
ST5
i=i+1
ST7
SUPPLY SOURCE RADIO FREQUENCY POWER
ST8
DETERMINE f[i+1,m] IN ACCORDANCE WITH DEGREE OF REFLECTION
ST9a

Fig.10

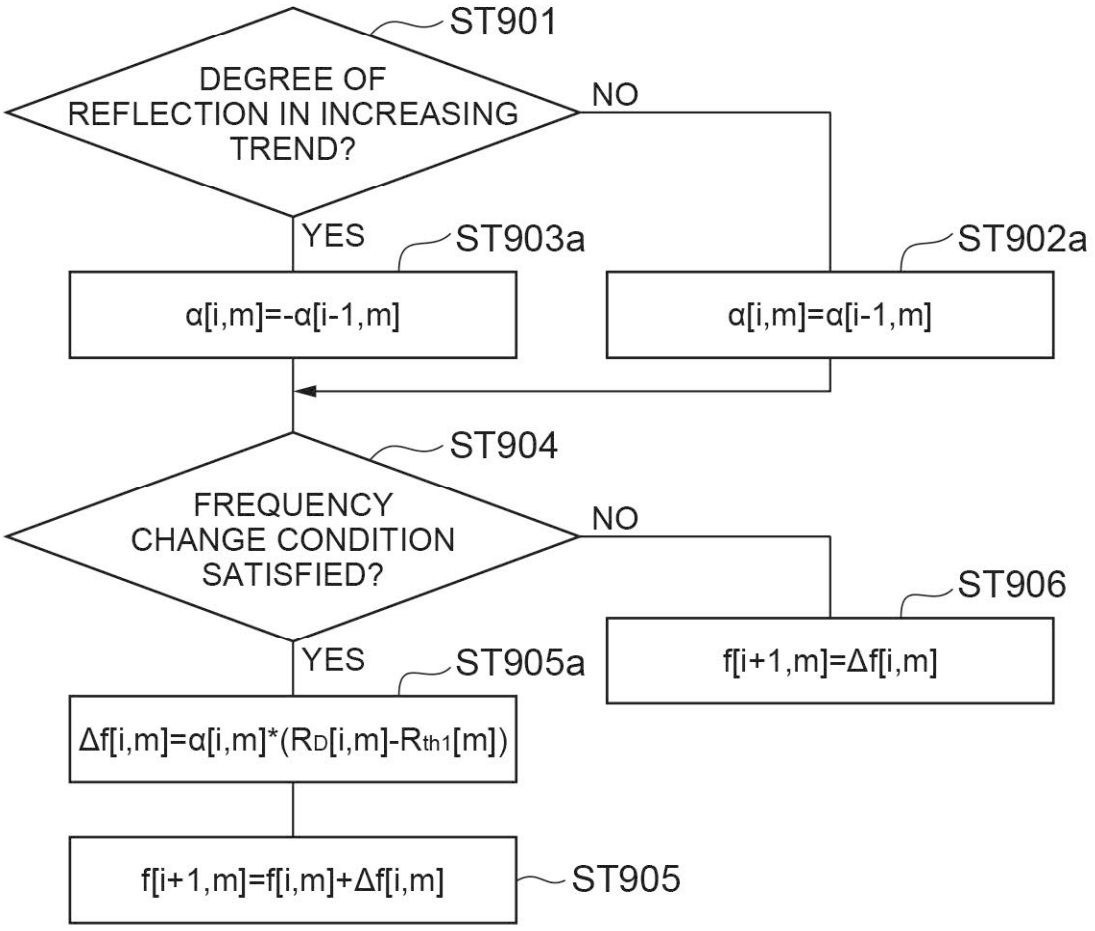

ST901
DEGREE OF REFLECTION IN INCREASING TREND?
NO
YES
ST903a
ST902a
α[i,m]=-α[i-1,m]
α[i,m]=α[i-1,m]
ST904
FREQUENCY CHANGE CONDITION SATISFIED?
NO
ST906
YES
ST905a
f[i+1,m]=Δf[i,m]
Δf[i,m]=α[i,m]*(RD[i,m]-Rth1[m])
f[i+1,m]=f[i,m]+Δf[i,m]
ST905

Fig.11

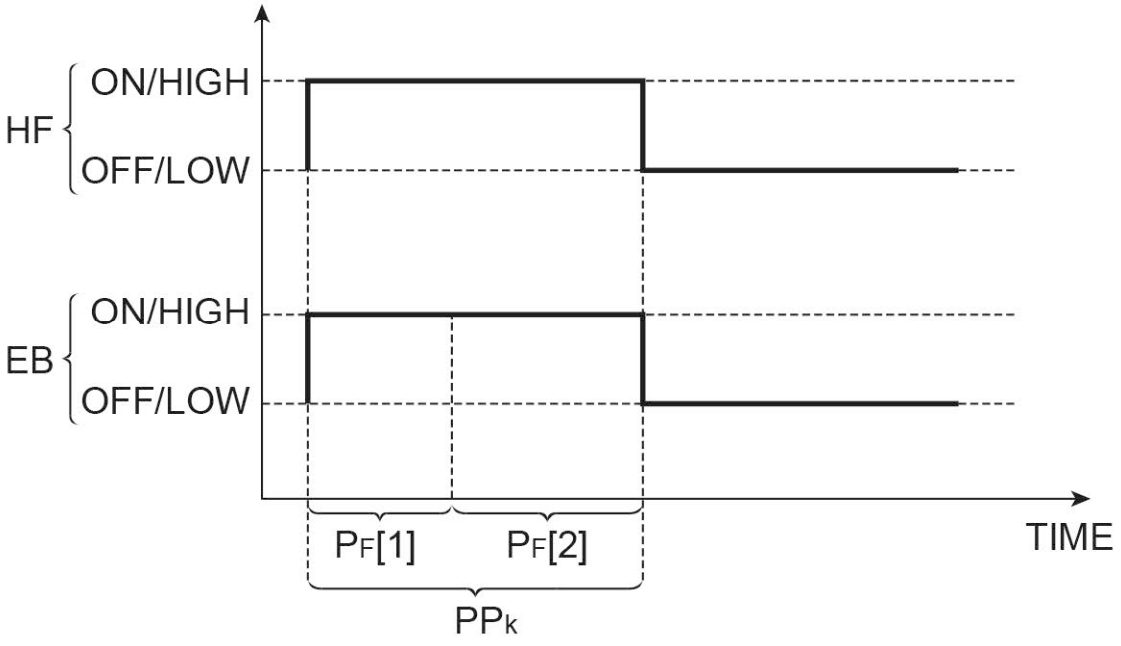


Fig.12

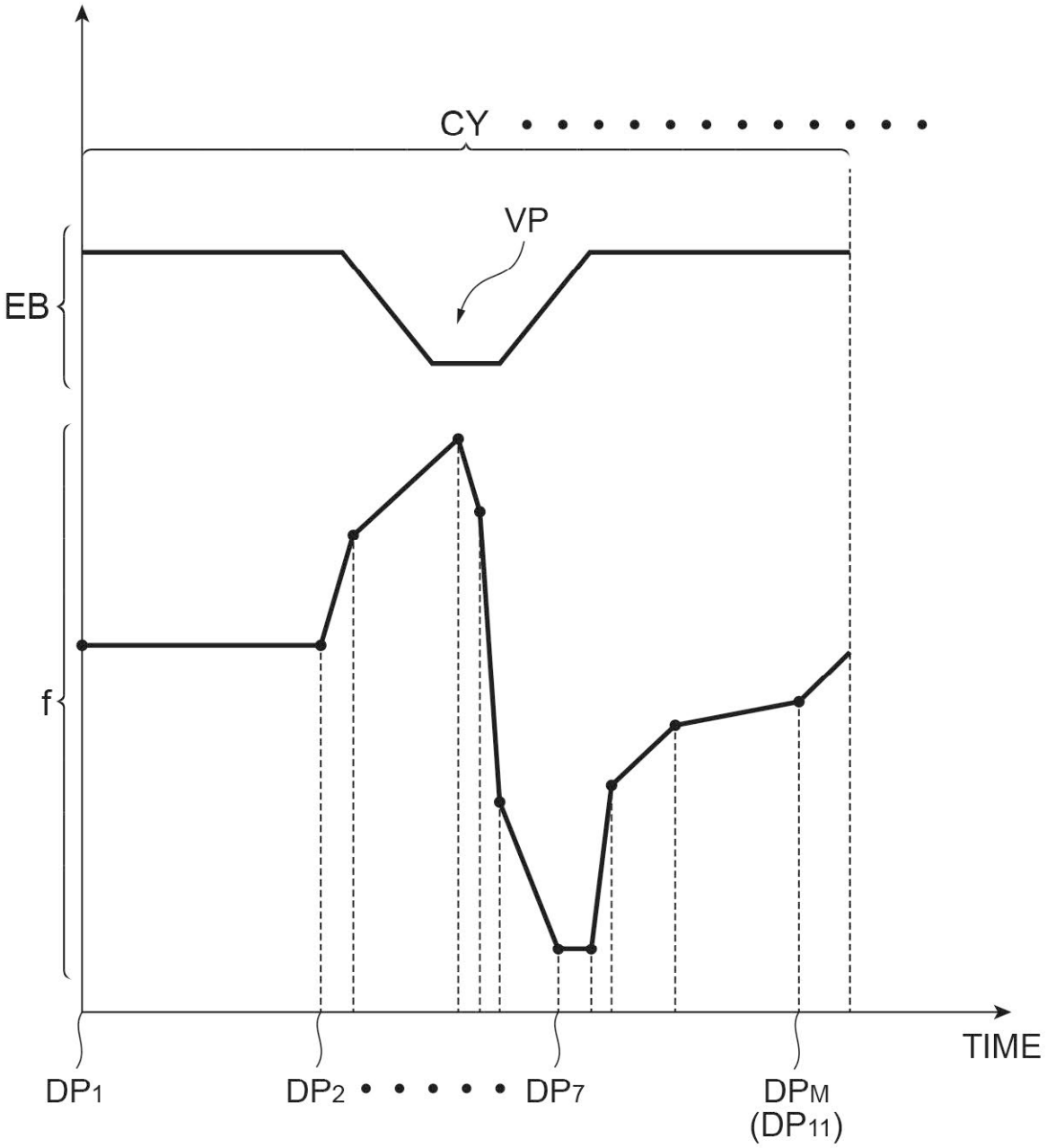


Fig.13

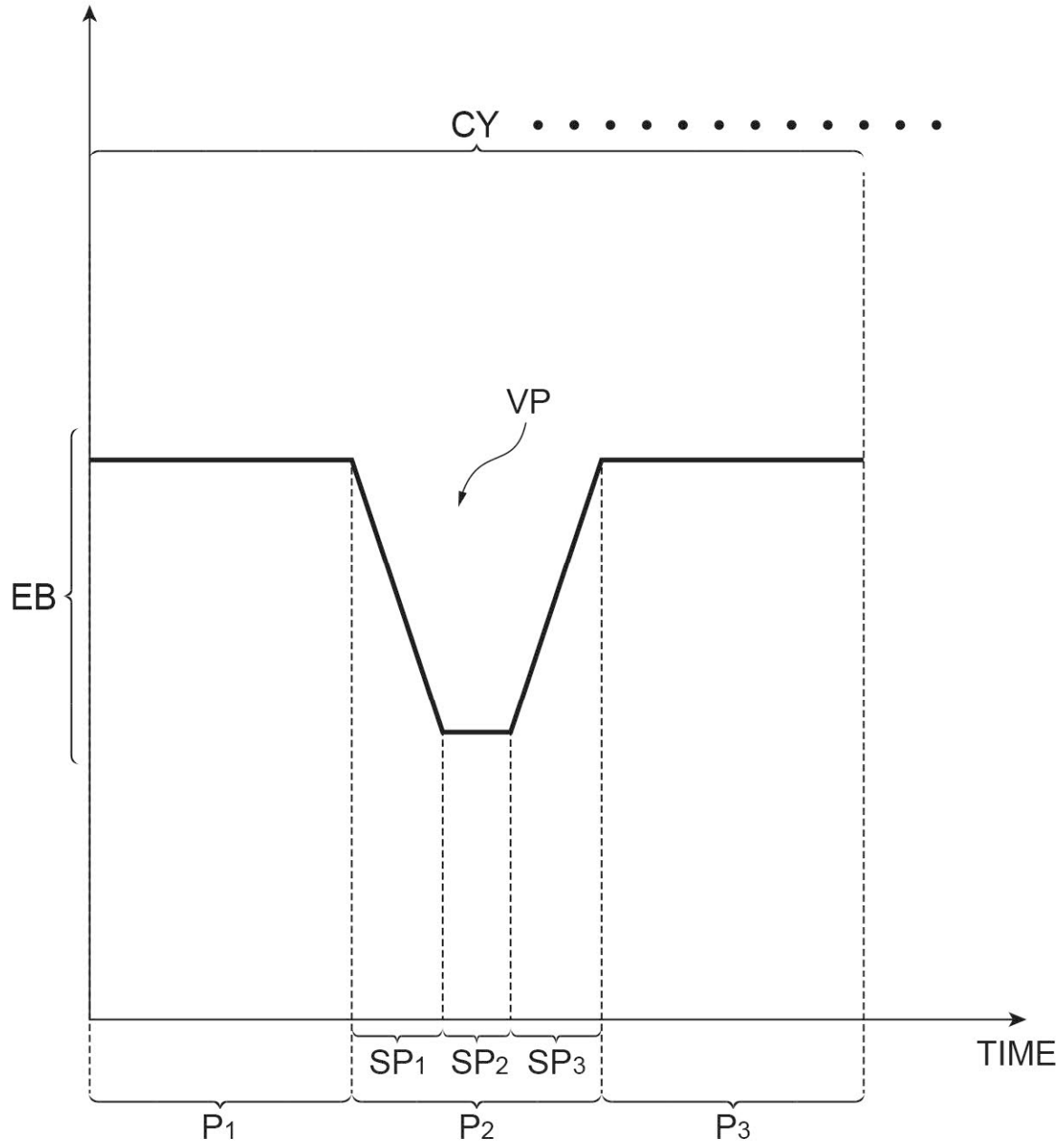


Fig.14

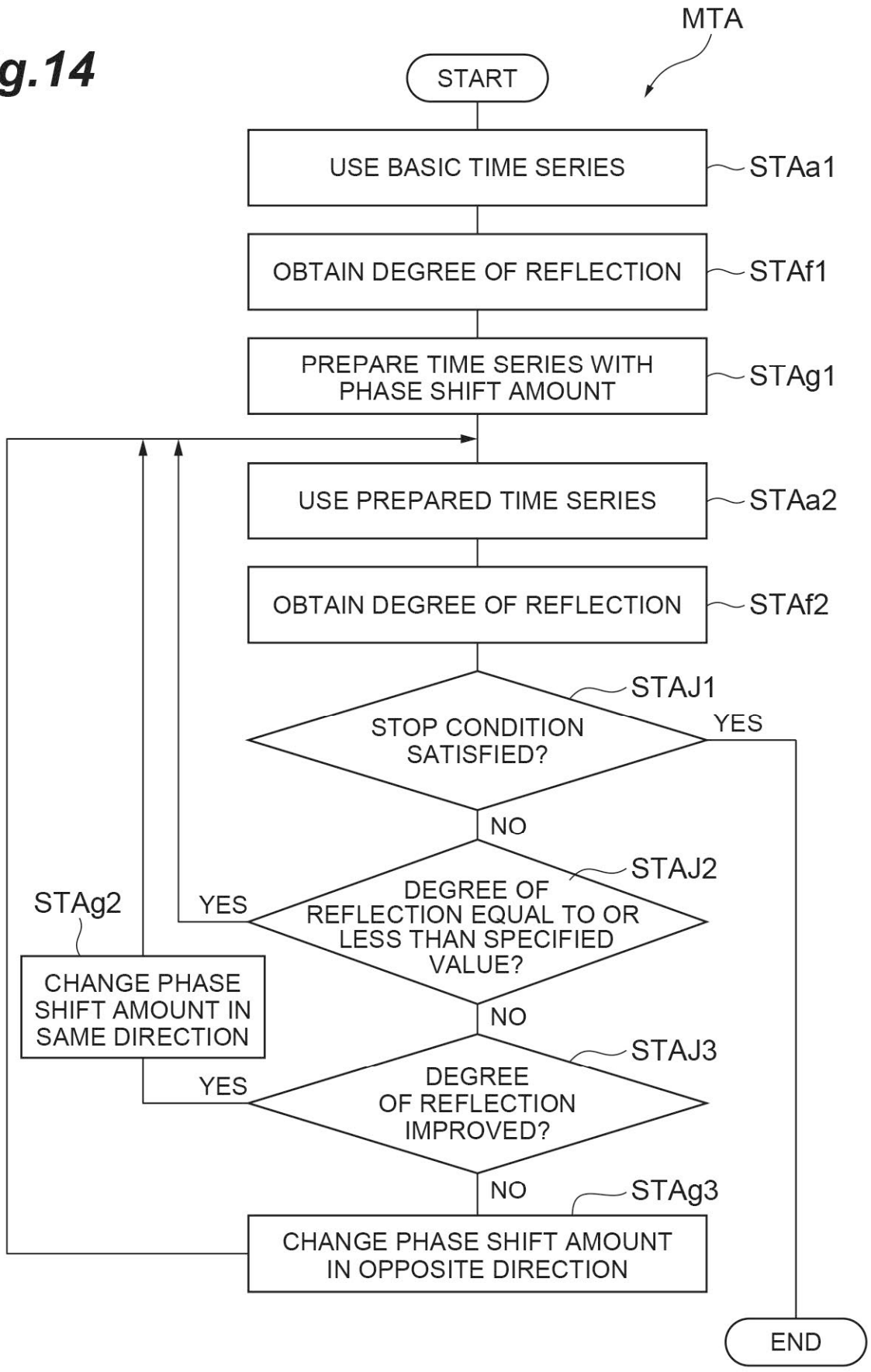

MTA
START
USE BASIC TIME SERIES
STAa1
OBTAIN DEGREE OF REFLECTION
STAf1
PREPARE TIME SERIES WITH PHASE SHIFT AMOUNT
STAg1
USE PREPARED TIME SERIES
STAa2
OBTAIN DEGREE OF REFLECTION
STAf2
STAJ1
STOP CONDITION SATISFIED?
YES
NO
STAJ2
DEGREE OF REFLECTION EQUAL TO OR LESS THAN SPECIFIED VALUE?
YES
STAg2
CHANGE PHASE SHIFT AMOUNT IN SAME DIRECTION
NO
STAJ3
DEGREE OF REFLECTION IMPROVED?
YES
NO
STAg3
CHANGE PHASE SHIFT AMOUNT IN OPPOSITE DIRECTION
END

Fig.15

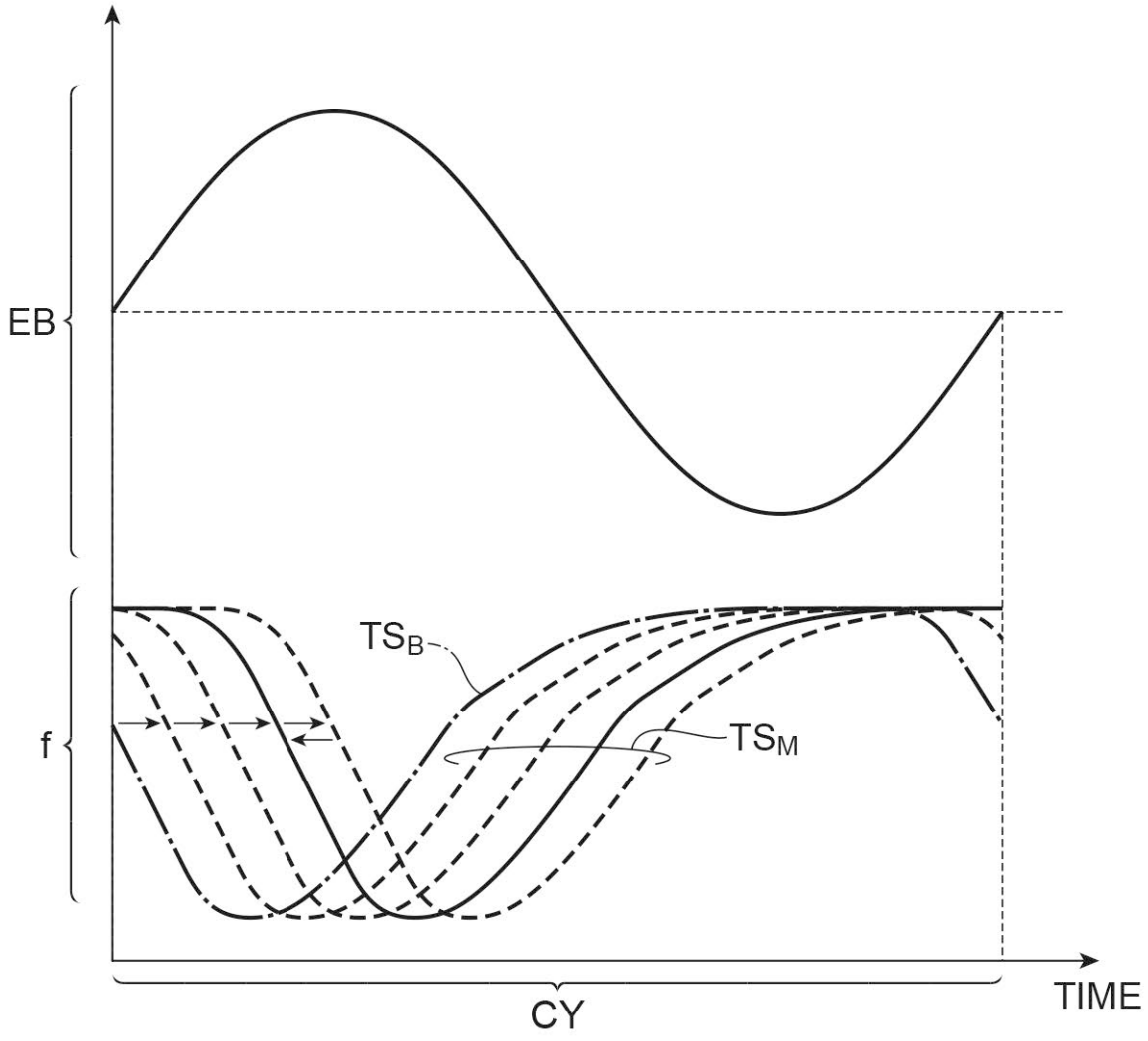


Fig.16

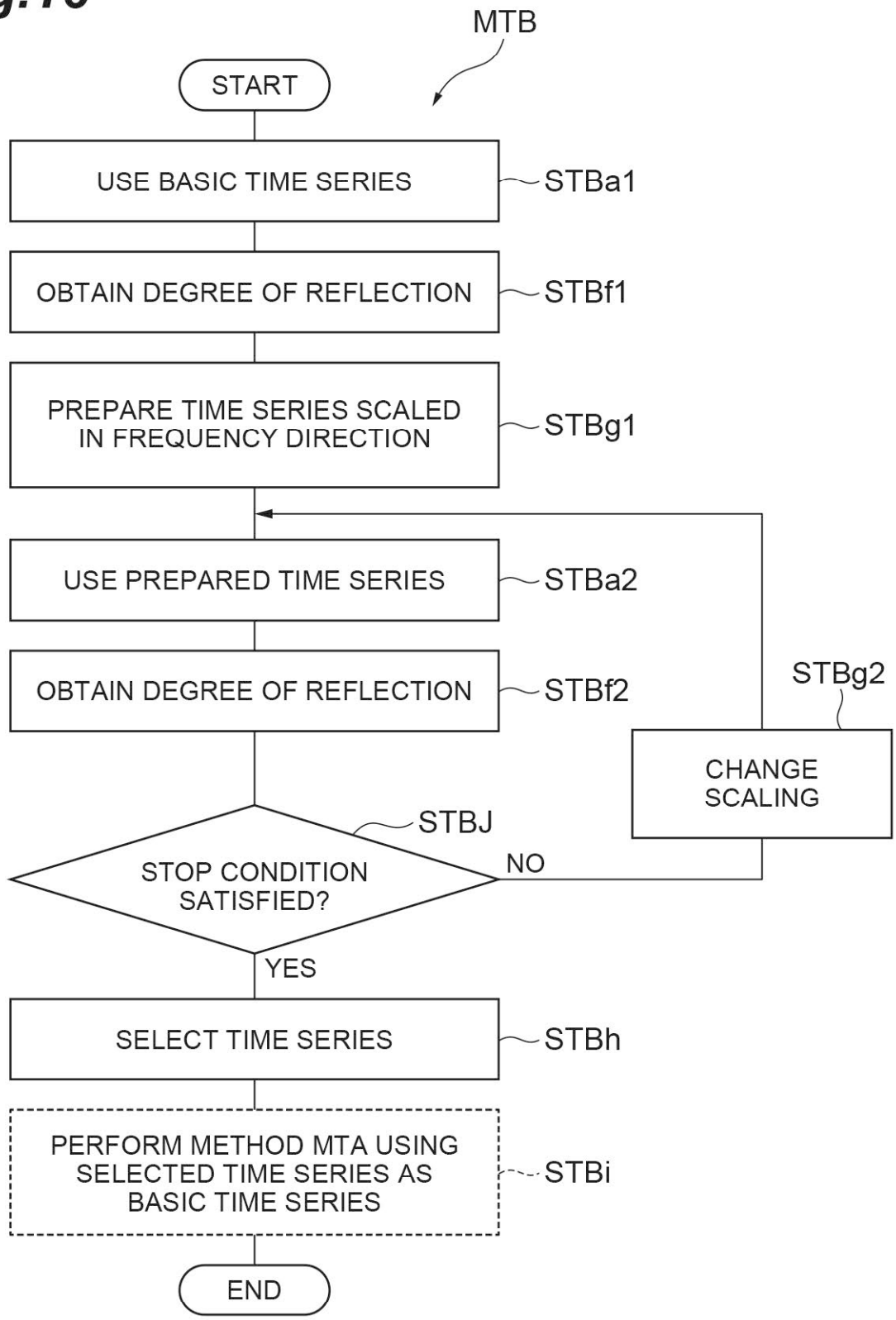

MTB
START
USE BASIC TIME SERIES
STBa1
OBTAIN DEGREE OF REFLECTION
STBf1
PREPARE TIME SERIES SCALED IN FREQUENCY DIRECTION
STBg1
USE PREPARED TIME SERIES
STBa2
OBTAIN DEGREE OF REFLECTION
STBf2
STBg2
CHANGE SCALING
STBJ
STOP CONDITION SATISFIED?
NO
YES
SELECT TIME SERIES
STBh
PERFORM METHOD MTA USING SELECTED TIME SERIES AS BASIC TIME SERIES
STBi
END

Fig.17

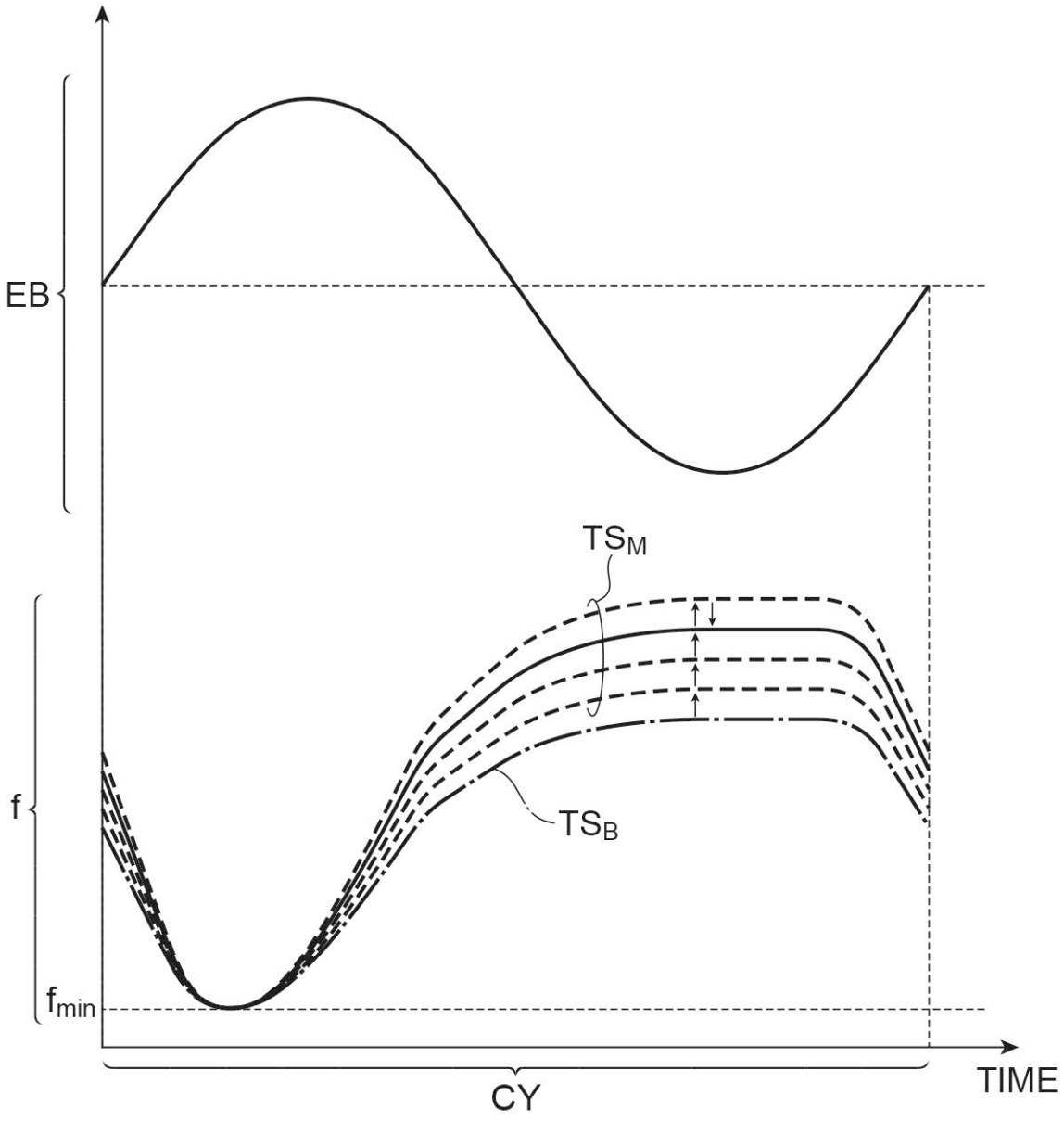


Fig.18

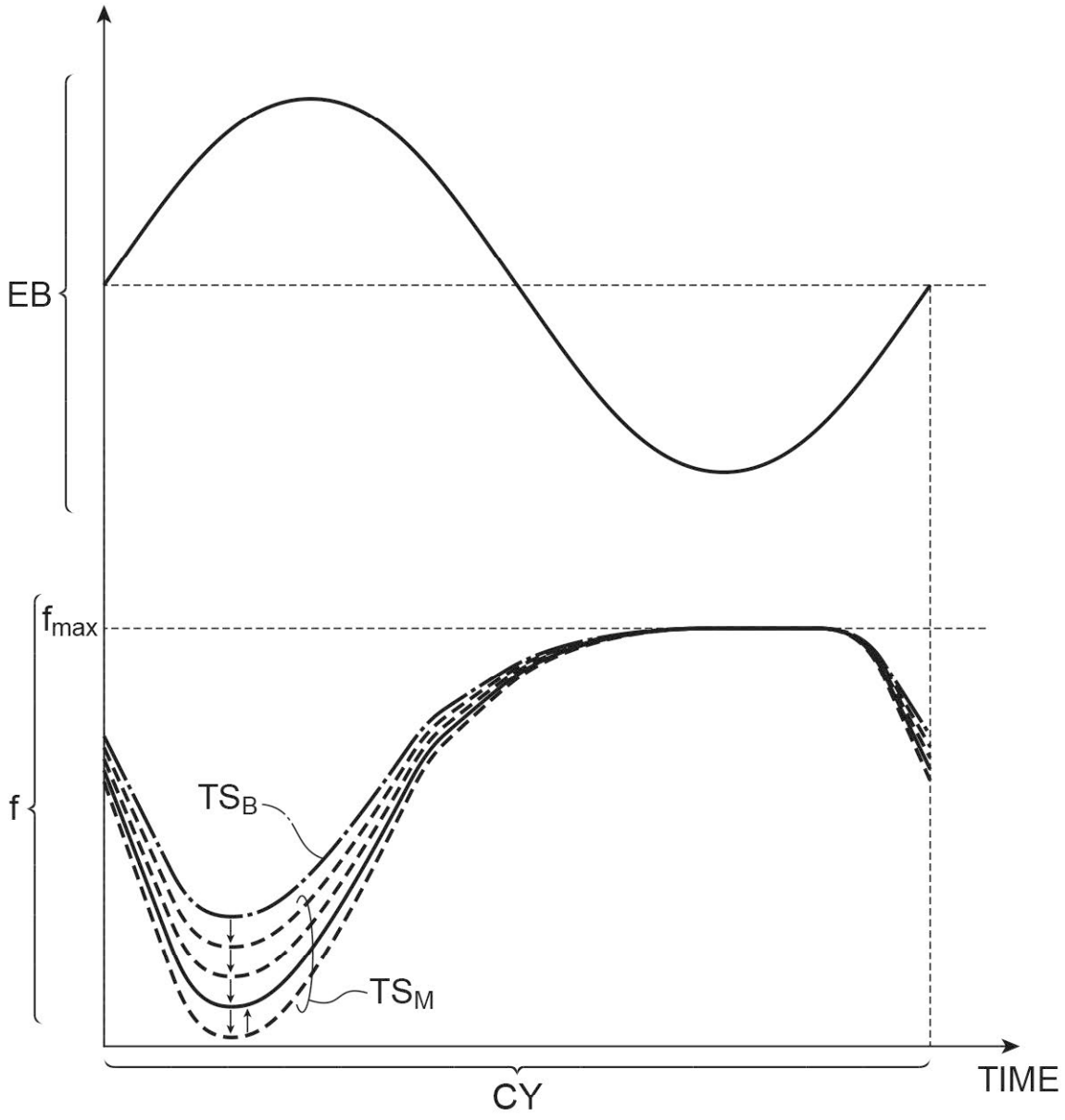


Fig.19

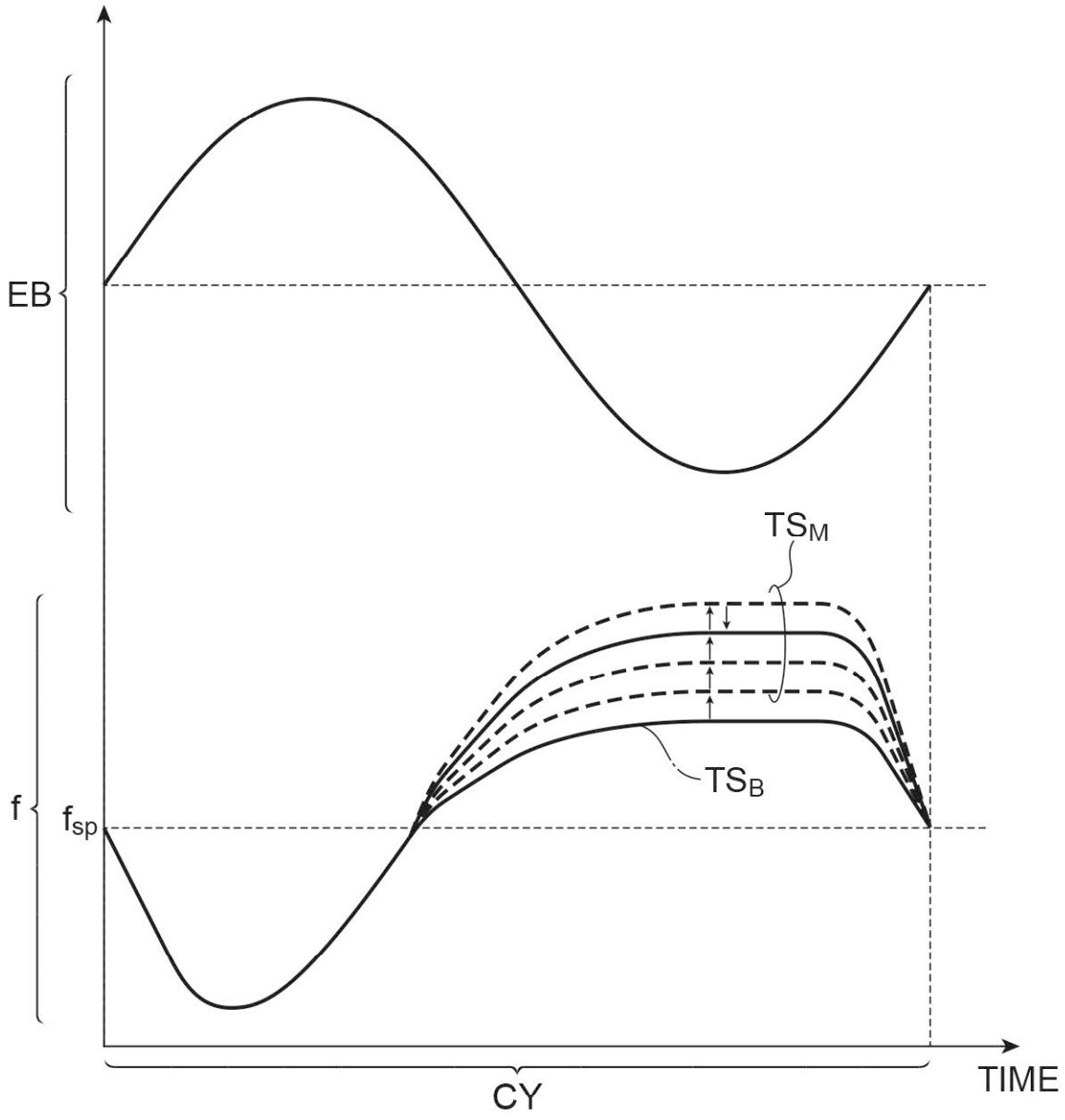


Fig.20

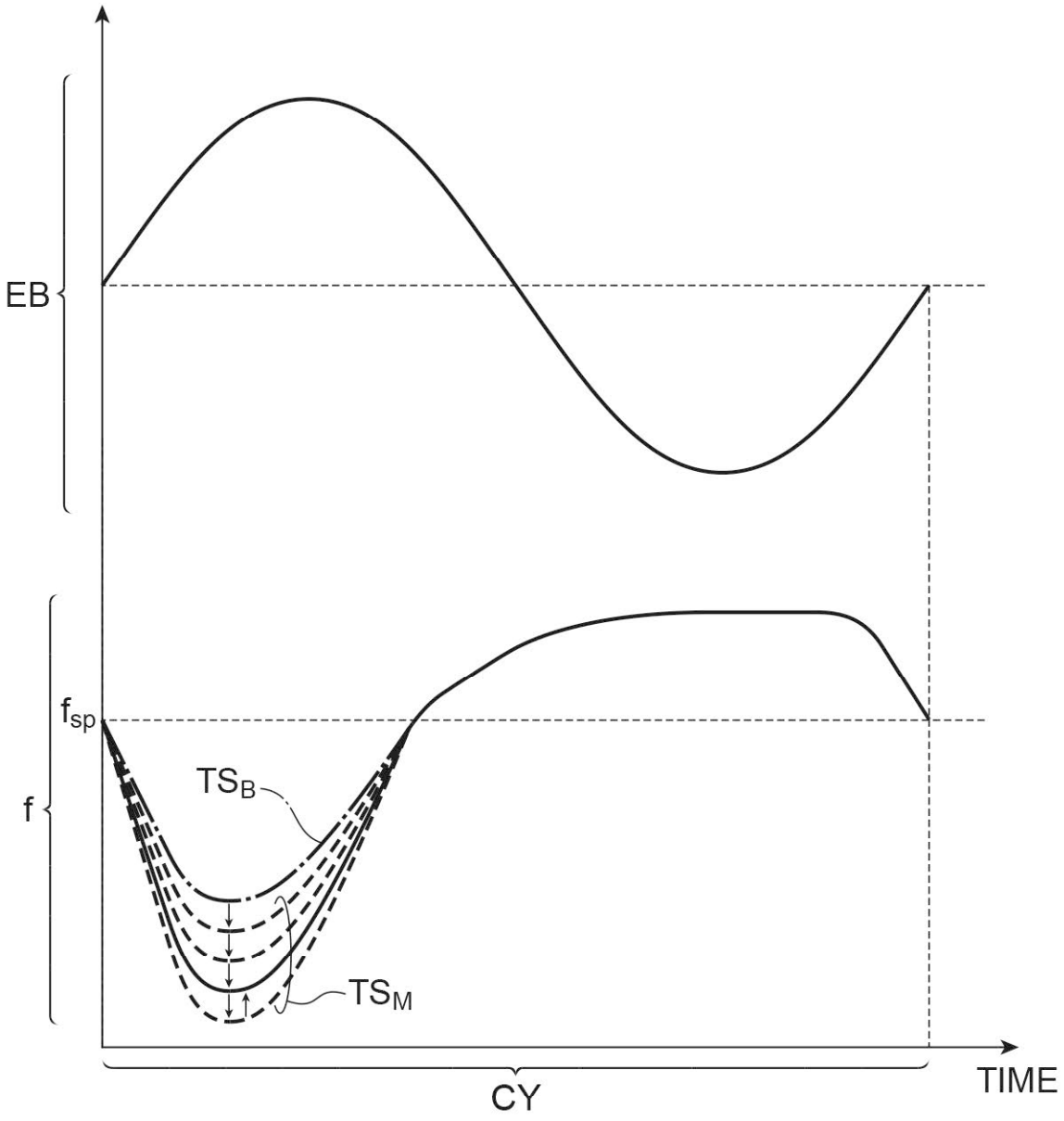


Fig.21

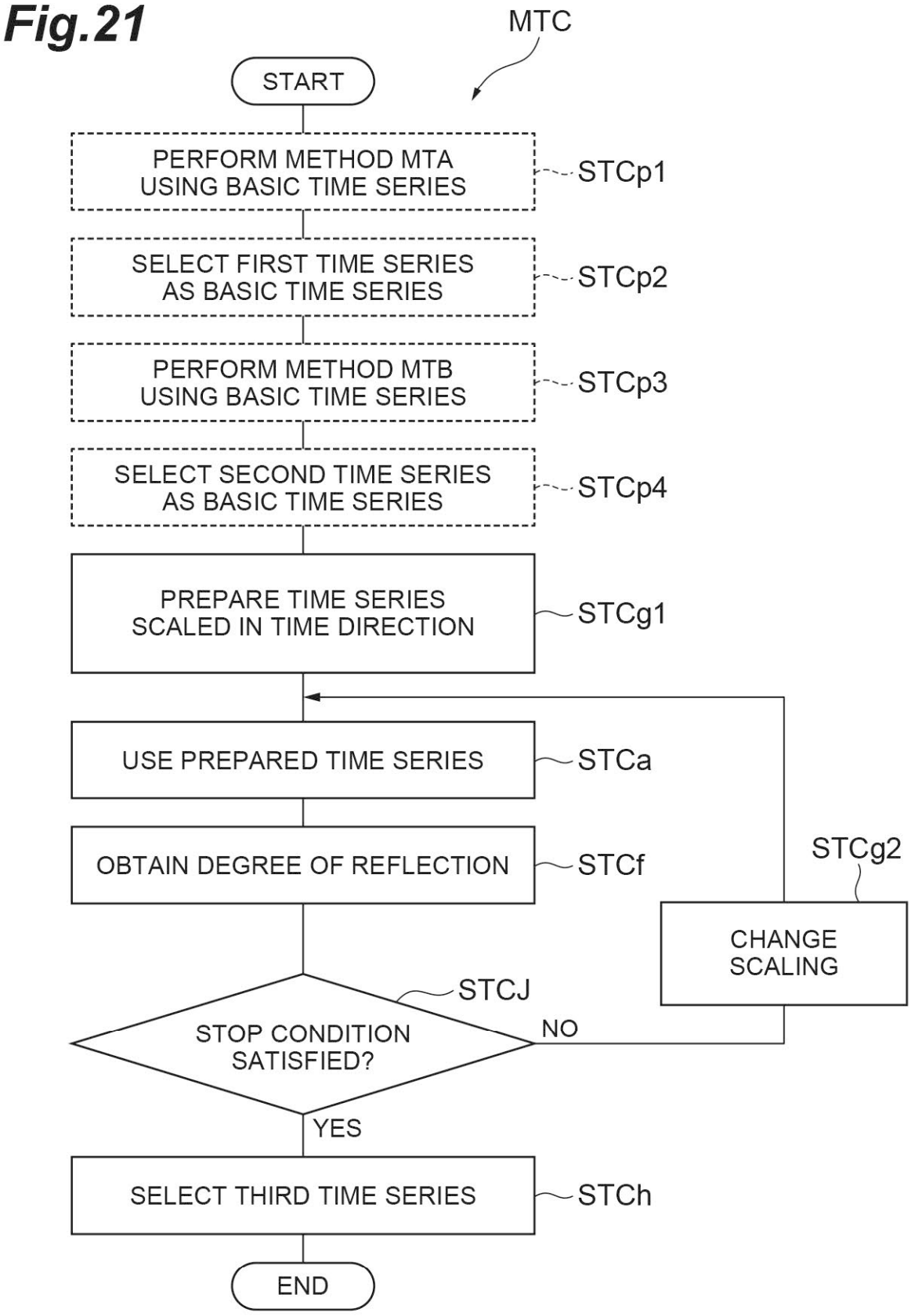
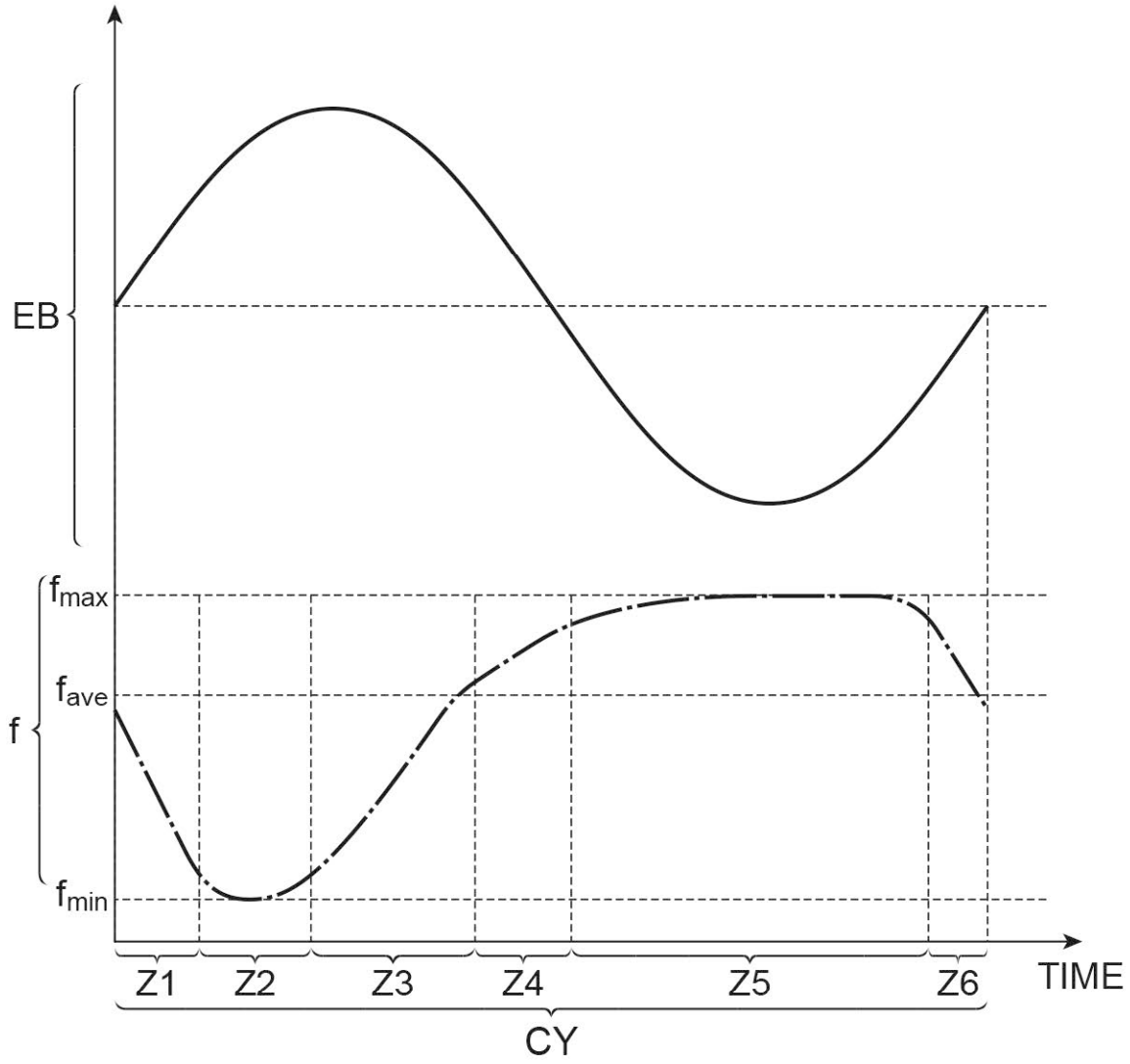

MTC
START
PERFORM METHOD MTA USING BASIC TIME SERIES
STCp1
SELECT FIRST TIME SERIES AS BASIC TIME SERIES
STCp2
PERFORM METHOD MTB USING BASIC TIME SERIES
STCp3
SELECT SECOND TIME SERIES AS BASIC TIME SERIES
STCp4
PREPARE TIME SERIES SCALED IN TIME DIRECTION
STCg1
USE PREPARED TIME SERIES
STCa
OBTAIN DEGREE OF REFLECTION
STCf
STCg2
CHANGE SCALING
STCJ
STOP CONDITION SATISFIED?
NO
YES
SELECT THIRD TIME SERIES
STCh
END

Fig.22



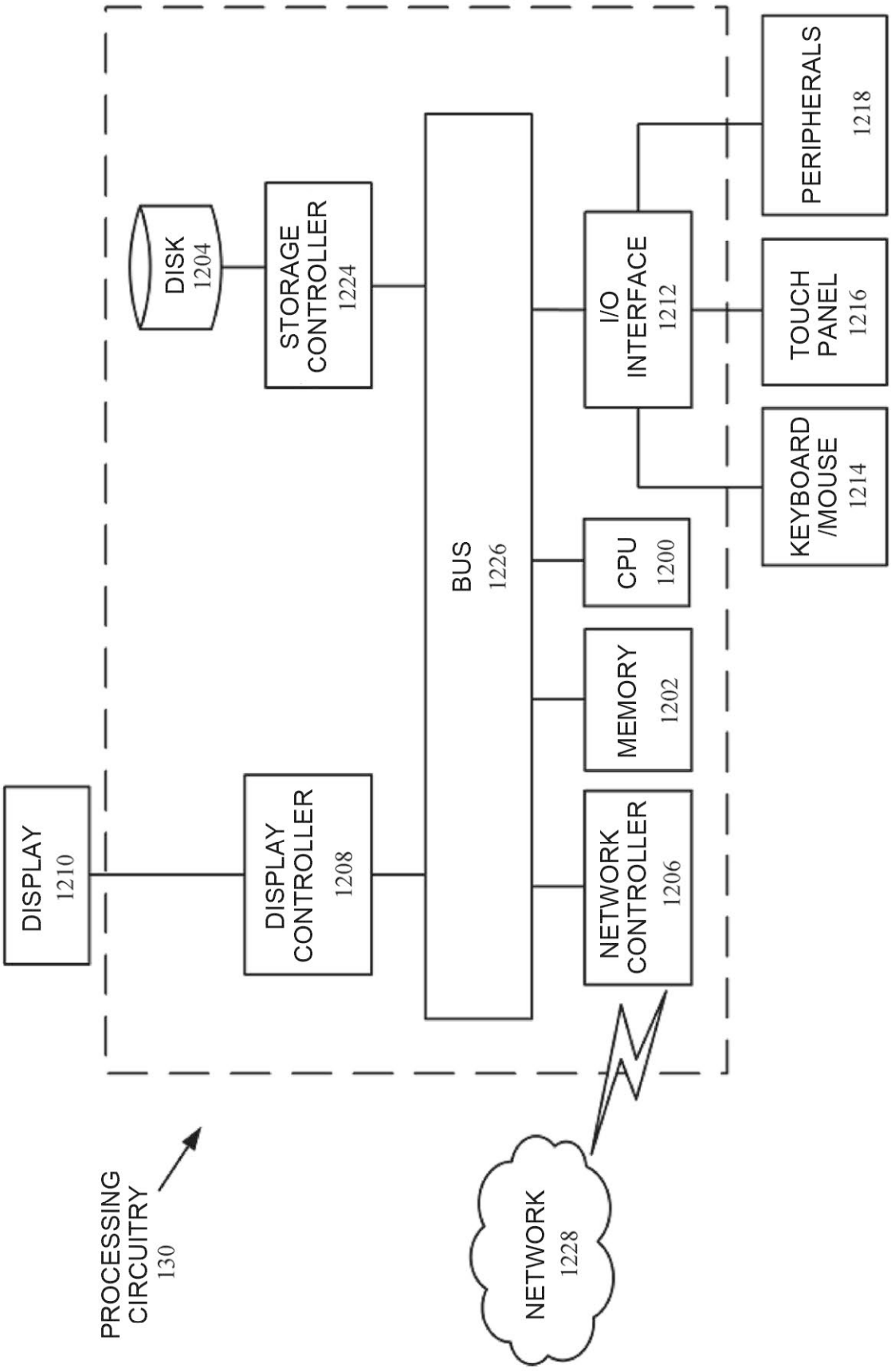

PROCESSING CIRCUITRY 130
NETWORK 1228
DISPLAY 1210
DISPLAY CONTROLLER 1208
DISK 1204
STORAGE CONTROLLER 1224
BUS 1226
NETWORK CONTROLLER 1206
MEMORY 1202
CPU 1200
I/O INTERFACE 1212
KEYBOARD /MOUSE 1214
TOUCH PANEL 1216
PERIPHERALS 1218

Fig.23