US012387701B2

(12) **United States Patent**
Okamura et al.

(10) **Patent No.: US 12,387,701 B2**
(45) **Date of Patent: *Aug. 12, 2025**

(54) **ELECTRONIC DEVICE, DATA USAGE METHOD, AND RECORDING MEDIUM**

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(73) Assignee: **Roland Corporation**, Shizuoka (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **17/970,588**

(22) Filed: **Oct. 21, 2022**

(65) **Prior Publication Data**

US 2023/0147370 A1 May 11, 2023

(30) **Foreign Application Priority Data**

Nov. 9, 2021 (JP) 2021-182814

(51) **Int. Cl.**
G10H 1/00 (2006.01)
H04L 65/1063 (2022.01)

(52) **U.S. Cl.**
CPC ***G10H 1/0083*** (2013.01); ***H04L 65/1063*** (2013.01); *G10H 2240/165* (2013.01); *G10H 2240/211* (2013.01); *G10H 2240/285* (2013.01)

(58) **Field of Classification Search**
CPC H04L 65/1063
See application file for complete search history.

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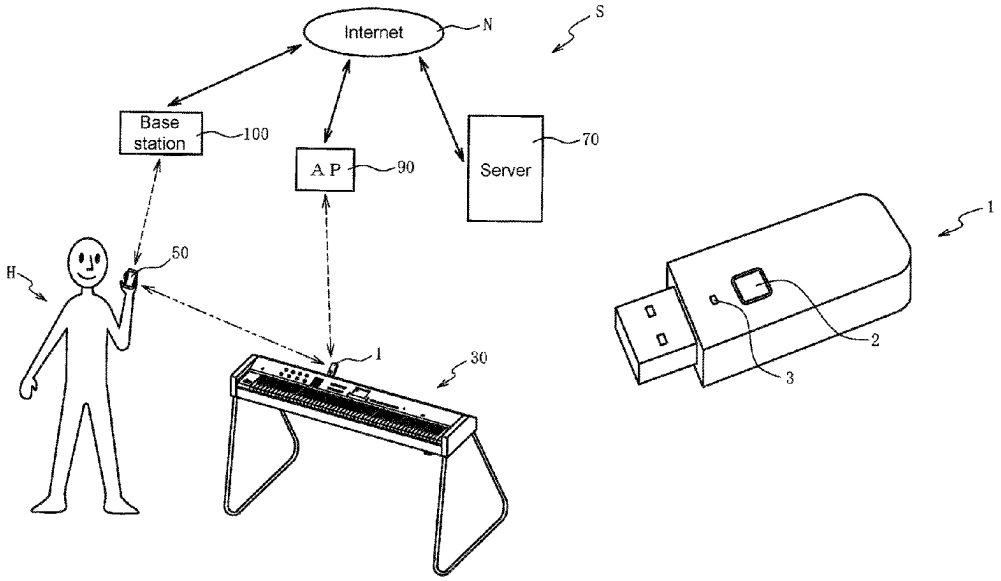
(74) *Attorney, Agent, or Firm* — JCIPRNET

(57) **ABSTRACT**

An electronic device and a data usage method are provided. An electronic musical instrument confirms whether respective sound data stored in a timbre memory or a wave memory can be used or cannot be used based on management information acquired from a server. A sound data determined to be usable in the management information is validated so that it can be used for loading or writing. On the other hand, a sound data determined to be unusable in the management information is invalidated so that it cannot be used.

13 Claims, 36 Drawing Sheets



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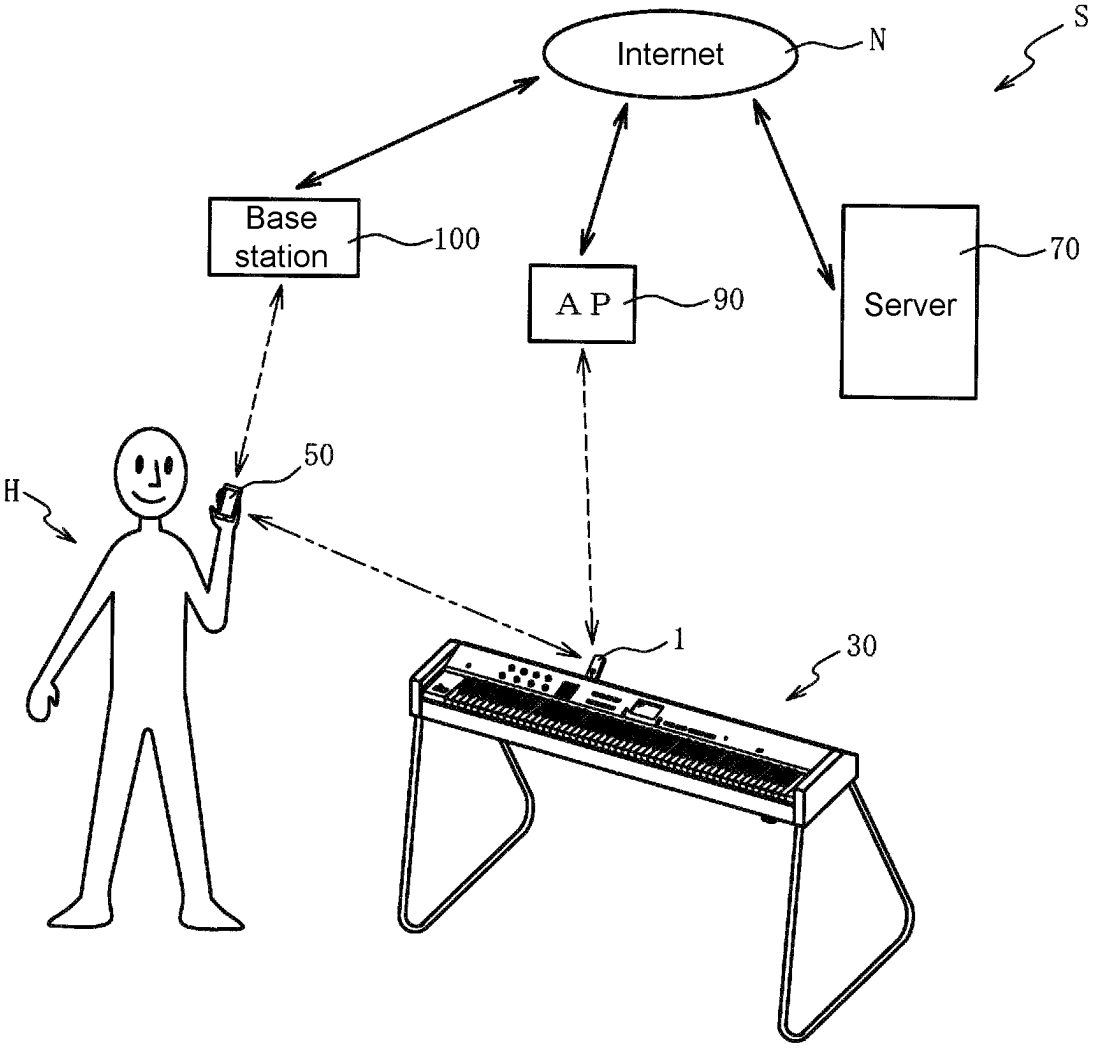

FIG. 1A

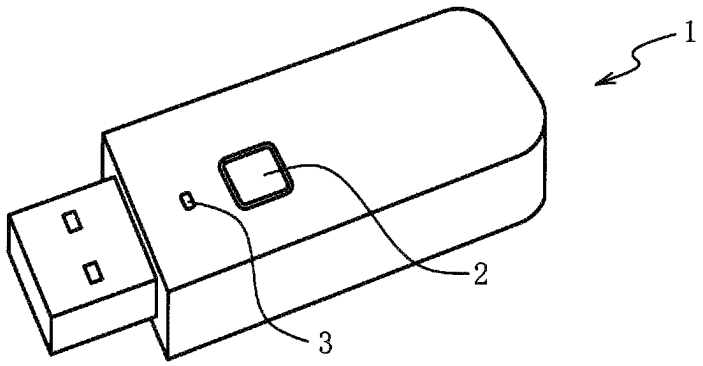

FIG. 1B

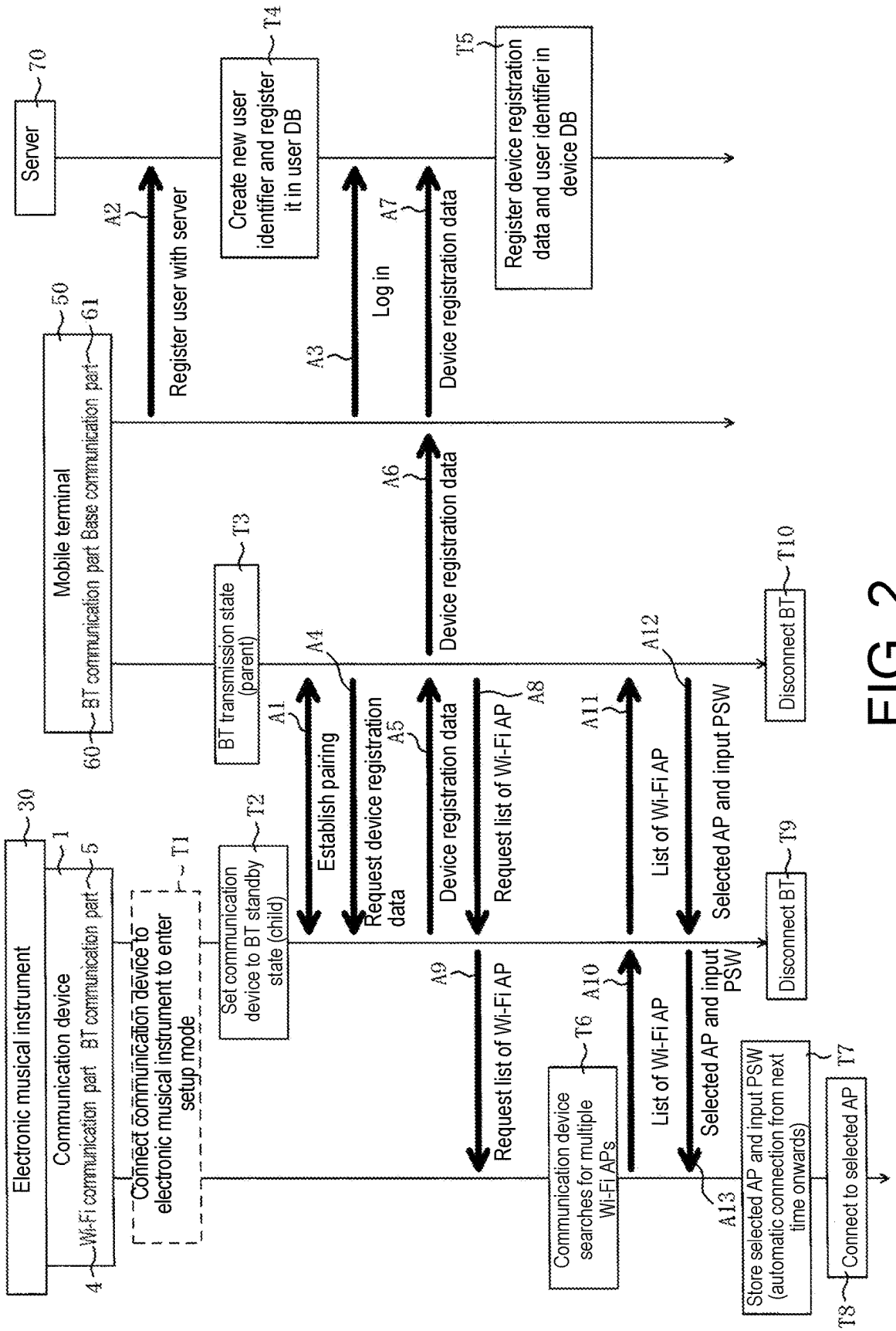
Server
70
Mobile terminal
50
BT communication part
60
Base communication part
61
Electronic musical instrument
30
Communication device
1
Wi-Fi communication part
4
BT communication part
5
Connect communication device to electronic musical instrument to enter setup mode
T1
Set communication device to BT standby state (child)
T2
BT transmission state (parent)
T3
Create new user identifier and register it in user DB
T4
Register device registration data and user identifier in device DB
T5
Communication device searches for multiple Wi-Fi APs
T6
Store selected AP and input PSW (automatic connection from next time onwards)
T7
Connect to selected AP
T8
Disconnect BT
T9
Disconnect BT
T10
Register user with server
A2
Log in
A3
Device registration data
A7
Device registration data
A6
Establish pairing
A1
Request device registration data
A4
Device registration data
A5
Request list of Wi-Fi AP
A8
Request list of Wi-Fi AP
A9
List of Wi-Fi AP
A11
Selected AP and input PSW
A12
List of Wi-Fi AP
A10
Selected AP and input PSW
A13

FIG. 2

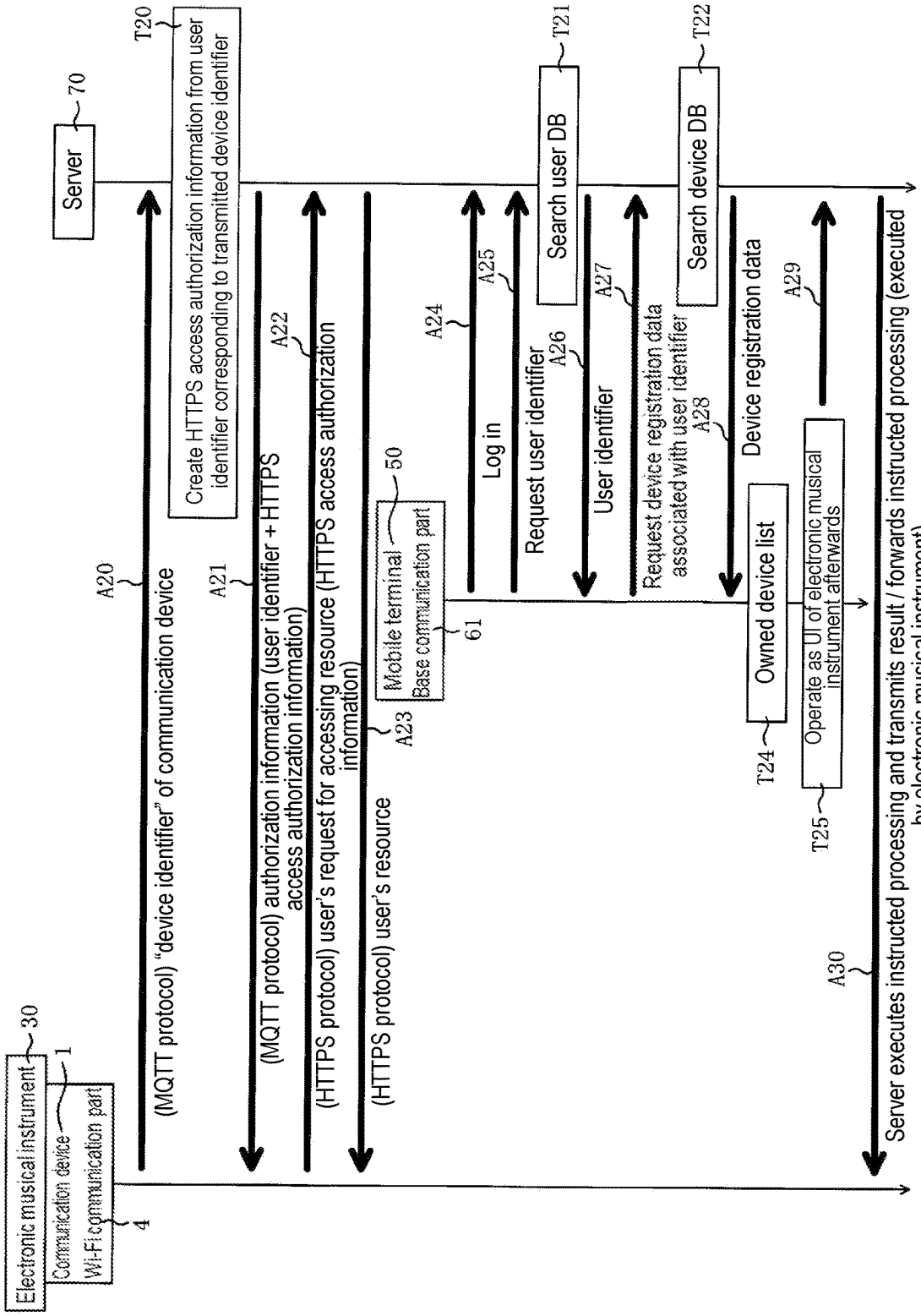
Electronic musical instrument
30
Communication device
Wi-Fi communication part
1
4
Server
70
T20
Create HTTPS access authorization information from user identifier corresponding to transmitted device identifier
A20
(MQTT protocol) "device identifier" of communication device
A21
(MQTT protocol) authorization information (user identifier + HTTPS access authorization information)
A22
(HTTPS protocol) user's request for accessing resource (HTTPS access authorization information)
A23
(HTTPS protocol) user's resource
Mobile terminal
Base communication part
50
61
A24
Log in
A25
Request user identifier
A26
User identifier
T21
Search user DB
A27
Request device registration data associated with user identifier
A28
Device registration data
T22
Search device DB
Owned device list
T24
Operate as UI of electronic musical instrument afterwards
T25
A29
A30
Server executes instructed processing and transmits result / forwards instructed processing (executed by electronic musical instrument)

FIG. 3

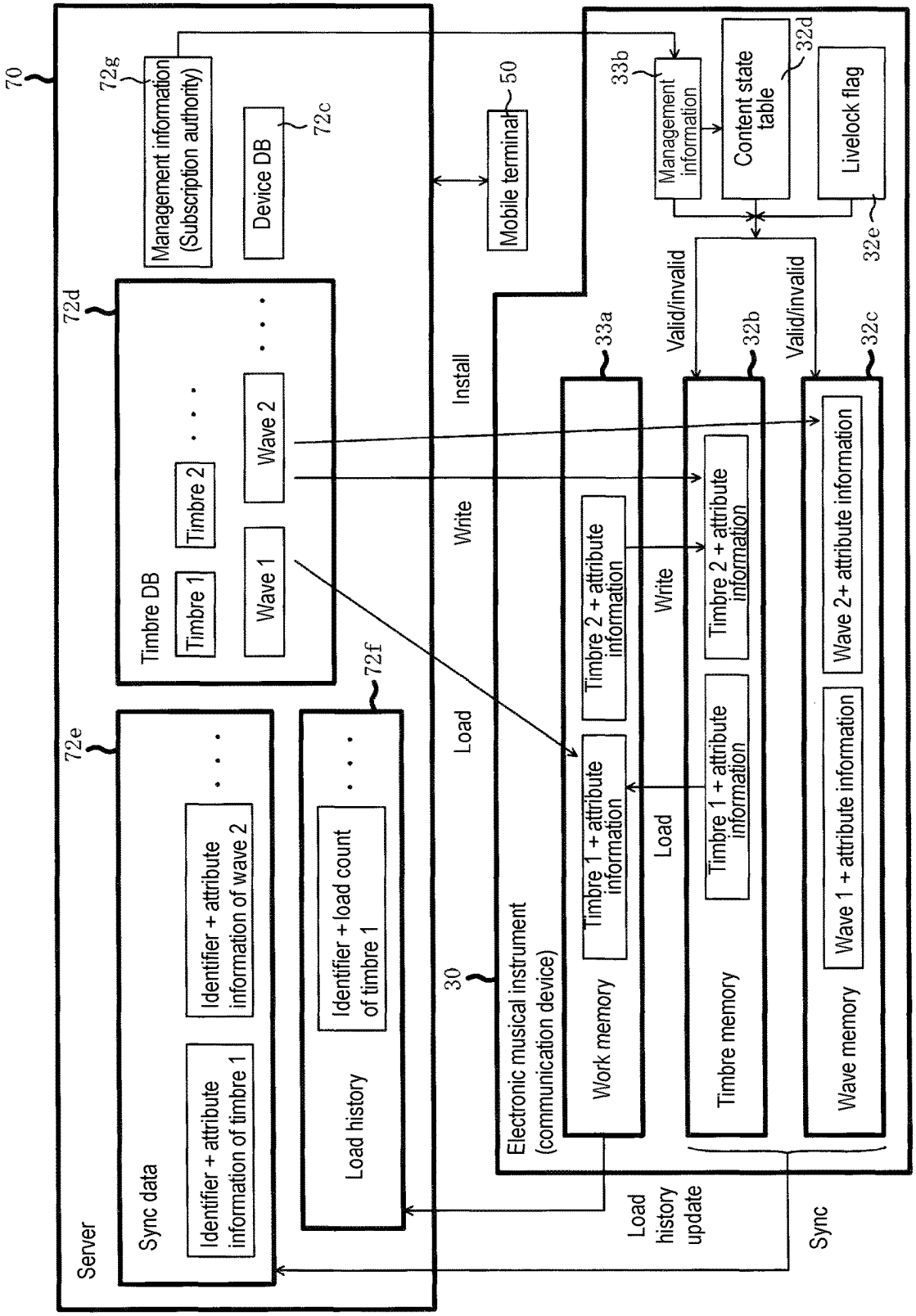
70
Server
72g
Management information (Subscription authority)
72c
Device DB
72d
Timbre DB
Timbre 1
Timbre 2
Wave 1
Wave 2
72e
Sync data
Identifier + attribute information of timbre 1
Identifier + attribute information of wave 2
72f
Load history
Identifier + load count of timbre 1
Install
Write
Load
50
Mobile terminal
30
Electronic musical instrument (communication device)
33a
Work memory
Timbre 2 + attribute information
Timbre 1 + attribute information
33b
Management information
Content state table
32d
Livelock flag
32e
Valid/invalid
32b
Timbre memory
Timbre 2 + attribute information
Timbre 1 + attribute information
Valid/invalid
32c
Wave memory
Wave 2+ attribute information
Wave 1 + attribute information
Load history update
Sync

FIG. 4

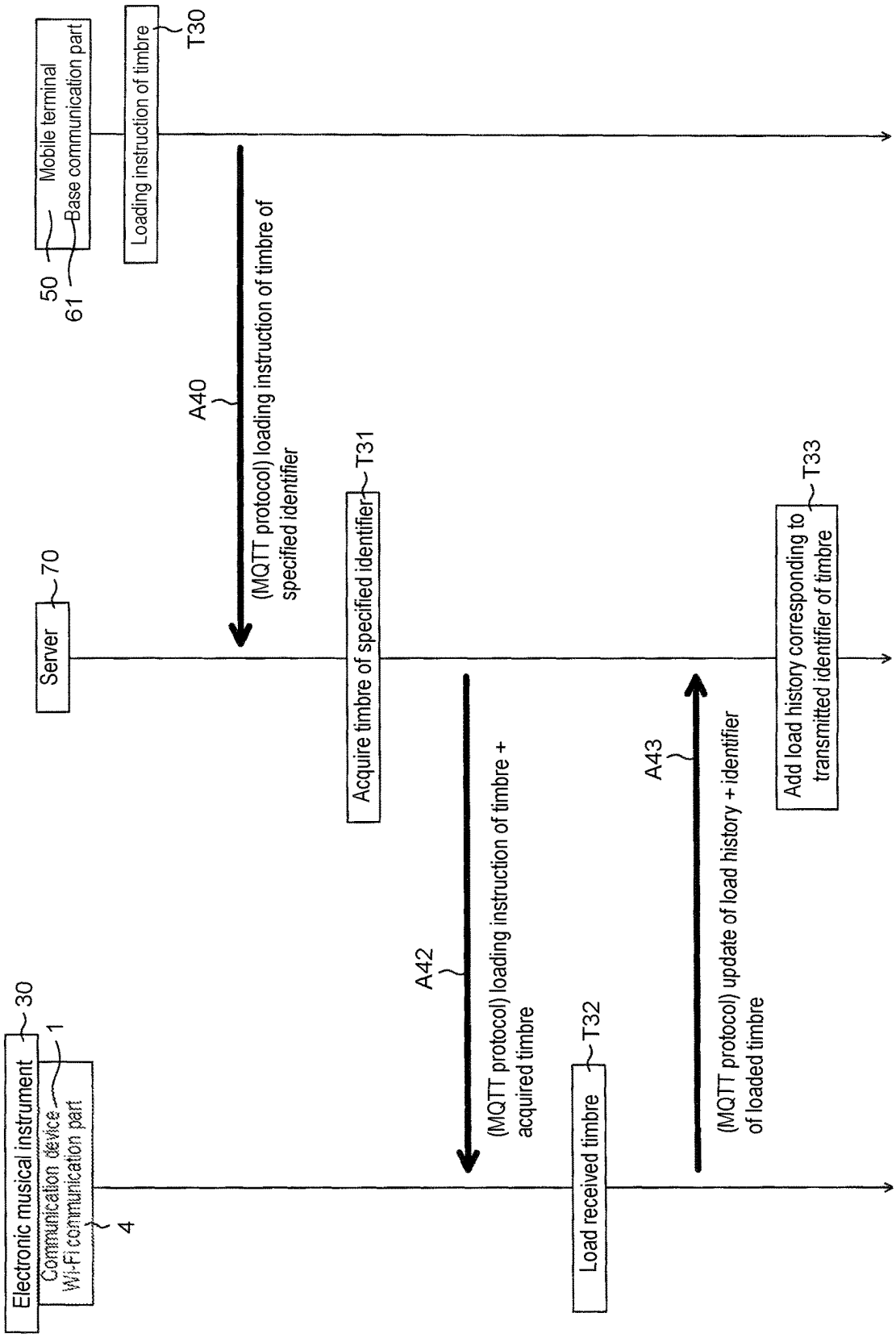
Mobile terminal
Base communication part
50
61
Loading instruction of timbre
T30
A40
(MQTT protocol) loading instruction of timbre of specified identifier
Server
70
Acquire timbre of specified identifier
T31
Add load history corresponding to transmitted identifier of timbre
T33
A42
(MQTT protocol) loading instruction of timbre + acquired timbre
A43
(MQTT protocol) update of load history + identifier of loaded timbre
Electronic musical instrument
30
Communication device
1
Wi-Fi communication part
4
Load received timbre
T32

FIG. 5

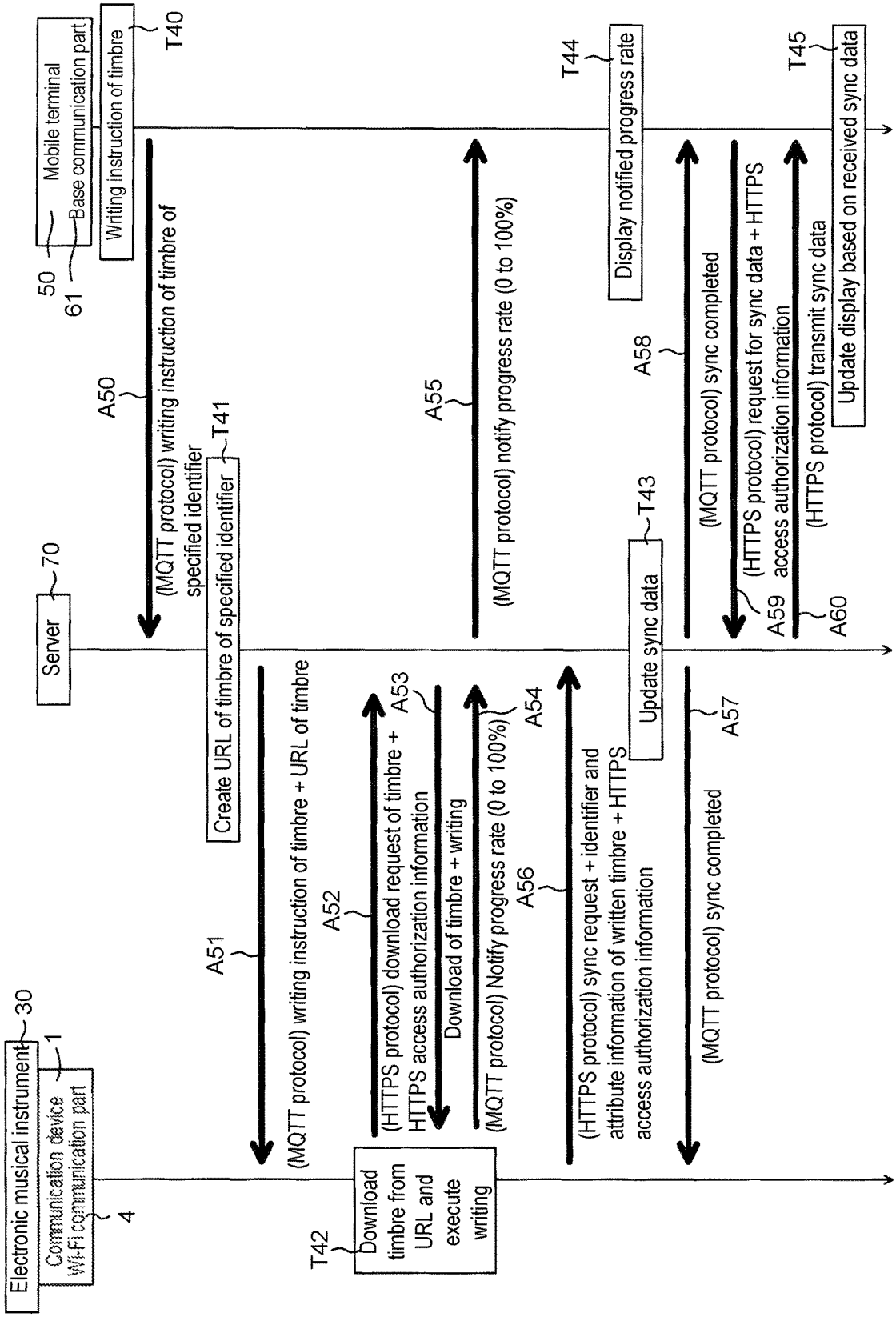
Mobile terminal
Base communication part
50
61
Writing instruction of timbre
T40
Display notified progress rate
T44
Display notified progress rate
T45
Update display based on received sync data
Server
70
A50
(MQTT protocol) writing instruction of timbre of specified identifier
Create URL of timbre of specified identifier
T41
A55
(MQTT protocol) notify progress rate (0 to 100%)
A58
(MQTT protocol) sync completed
(HTTPS protocol) request for sync data + HTTPS access authorization information
A59
(HTTPS protocol) transmit sync data
A60
Update sync data
T43
A51
(MQTT protocol) writing instruction of timbre + URL of timbre
A52
(HTTPS protocol) download request of timbre + HTTPS access authorization information
A53
Download of timbre + writing
(MQTT protocol) Notify progress rate (0 to 100%)
A54
A56
(HTTPS protocol) sync request + identifier and attribute information of written timbre + HTTPS access authorization information
A57
(MQTT protocol) sync completed
Electronic musical instrument
30
Communication device Wi-Fi communication part
1
4
Download timbre from URL and execute writing
T42

FIG. 6

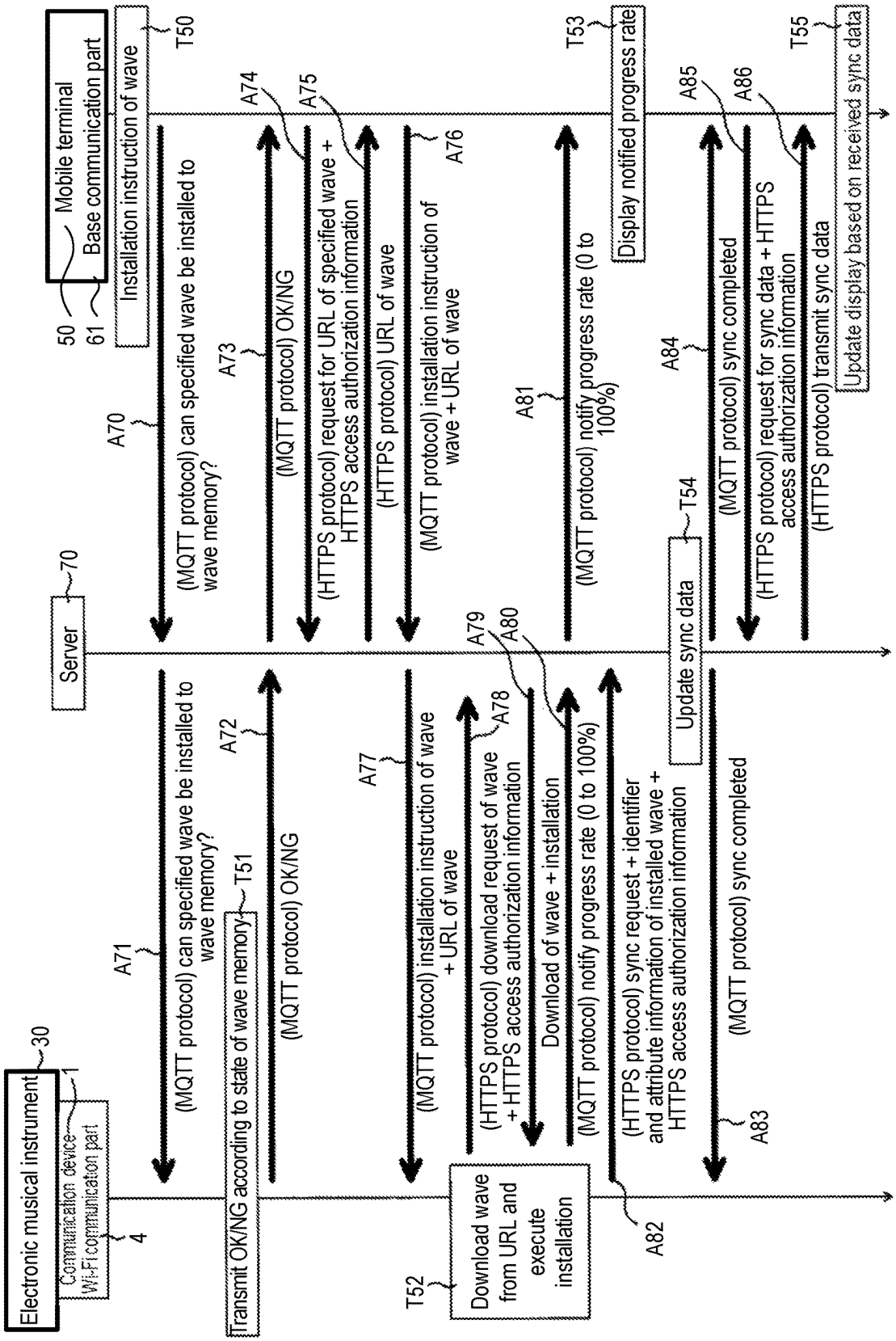
Mobile terminal
Base communication part
50
61
Installation instruction of wave
T50
Server
70
(MQTT protocol) can specified wave be installed to wave memory?
A70
(MQTT protocol) OK/NG
A73
(HTTPS protocol) request for URL of specified wave + HTTPS access authorization information
A74
A75
(HTTPS protocol) URL of wave
(MQTT protocol) installation instruction of wave + URL of wave
A76
(MQTT protocol) notify progress rate (0 to 100%)
A81
Display notified progress rate
T53
(MQTT protocol) sync completed
A84
(HTTPS protocol) request for sync data + HTTPS access authorization information
A85
A86
(HTTPS protocol) transmit sync data
Update display based on received sync data
T55
Update sync data
T54
Electronic musical instrument
30
Communication device Wi-Fi communication part
1
4
(MQTT protocol) can specified wave be installed to wave memory?
A71
Transmit OK/NG according to state of wave memory
T51
(MQTT protocol) OK/NG
A72
(MQTT protocol) installation instruction of wave + URL of wave
A77
(HTTPS protocol) download request of wave + HTTPS access authorization information
A78
Download of wave + installation
A79
A80
(MQTT protocol) notify progress rate (0 to 100%)
Download wave from URL and execute installation
T52
(HTTPS protocol) sync request + identifier and attribute information of installed wave + HTTPS access authorization information
A82
(MQTT protocol) sync completed
A83

FIG. 7

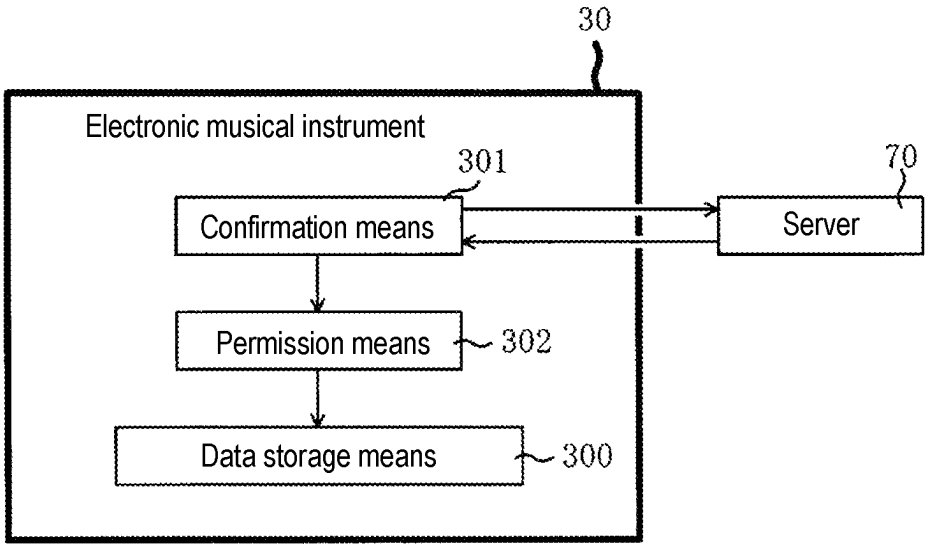
30
Electronic musical instrument
301
70
Confirmation means
Server
Permission means
302
Data storage means
300

FIG. 8

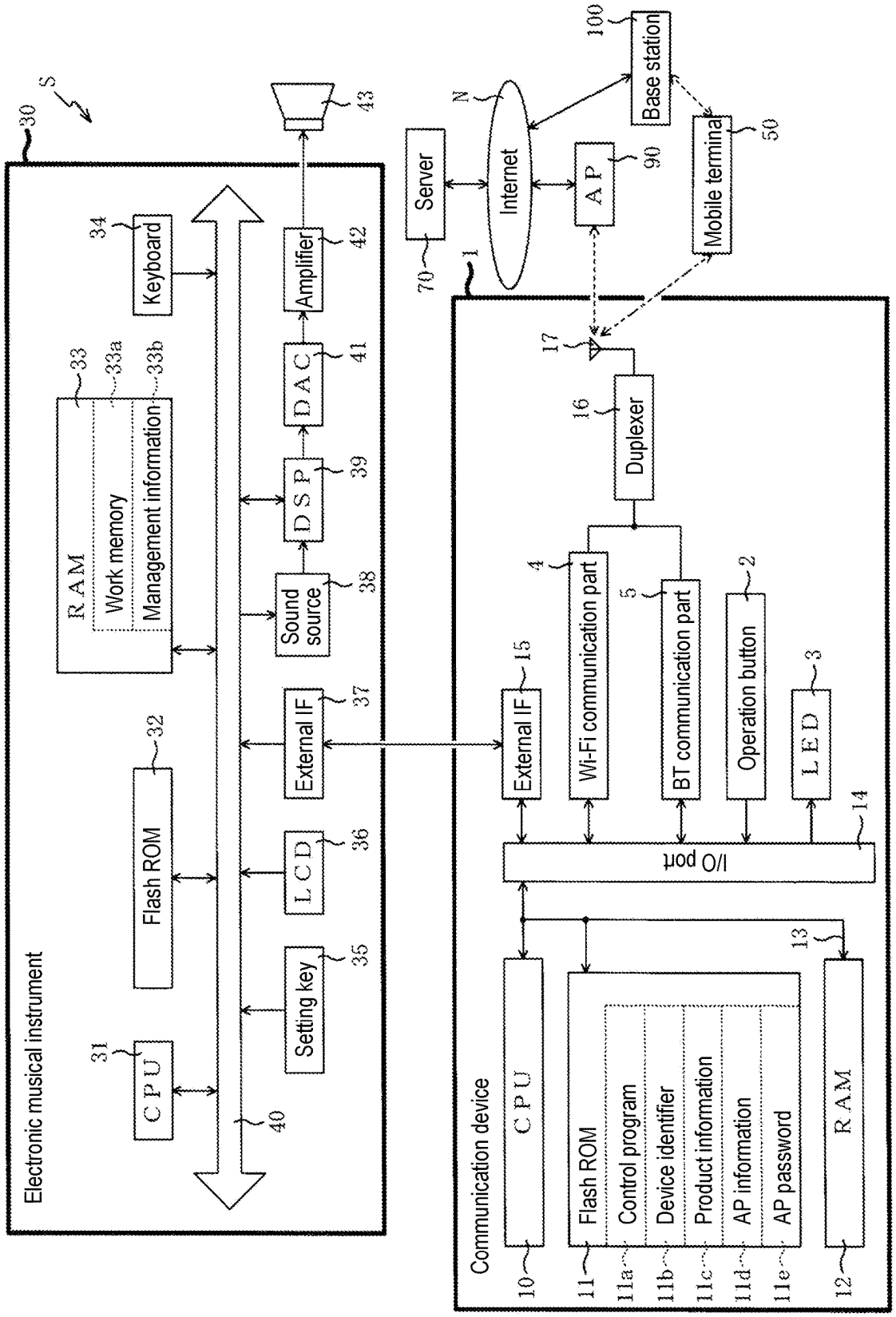
S
30
Electronic musical instrument
31
C P U
32
Flash ROM
33
33a
33b
R A M
Work memory
Management information
34
Keyboard
35
Setting key
36
L C D
37
External IF
38
Sound source
39
D S P
41
D A C
42
Amplifier
43
40
N
Server
70
Internet
Base station
100
A P
90
Mobile terminal
50
1
Communication device
10
C P U
11
Flash ROM
11a
Control program
11b
Device identifier
11c
Product information
11d
AP information
11e
AP password
12
R A M
13
14
I/O port
15
External IF
4
Wi-Fi communication part
5
BT communication part
2
Operation button
3
L E D
16
Duplexer
17

FIG. 9

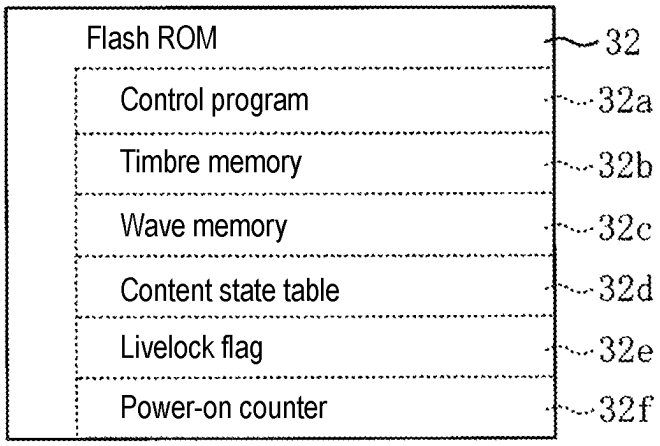

FIG. 10A

Content state table 32d

No.	Identifier	License type	Valid/invalid
1	SD_A	Subscription	Valid
2	SD_B	Subscription	Invalid
3	SD_D	Permanent	Valid
:	:	:	:
10	WV_A	Permanent	Valid
11	WV_C	Subscription	Valid
:	:	:	:

FIG. 10B

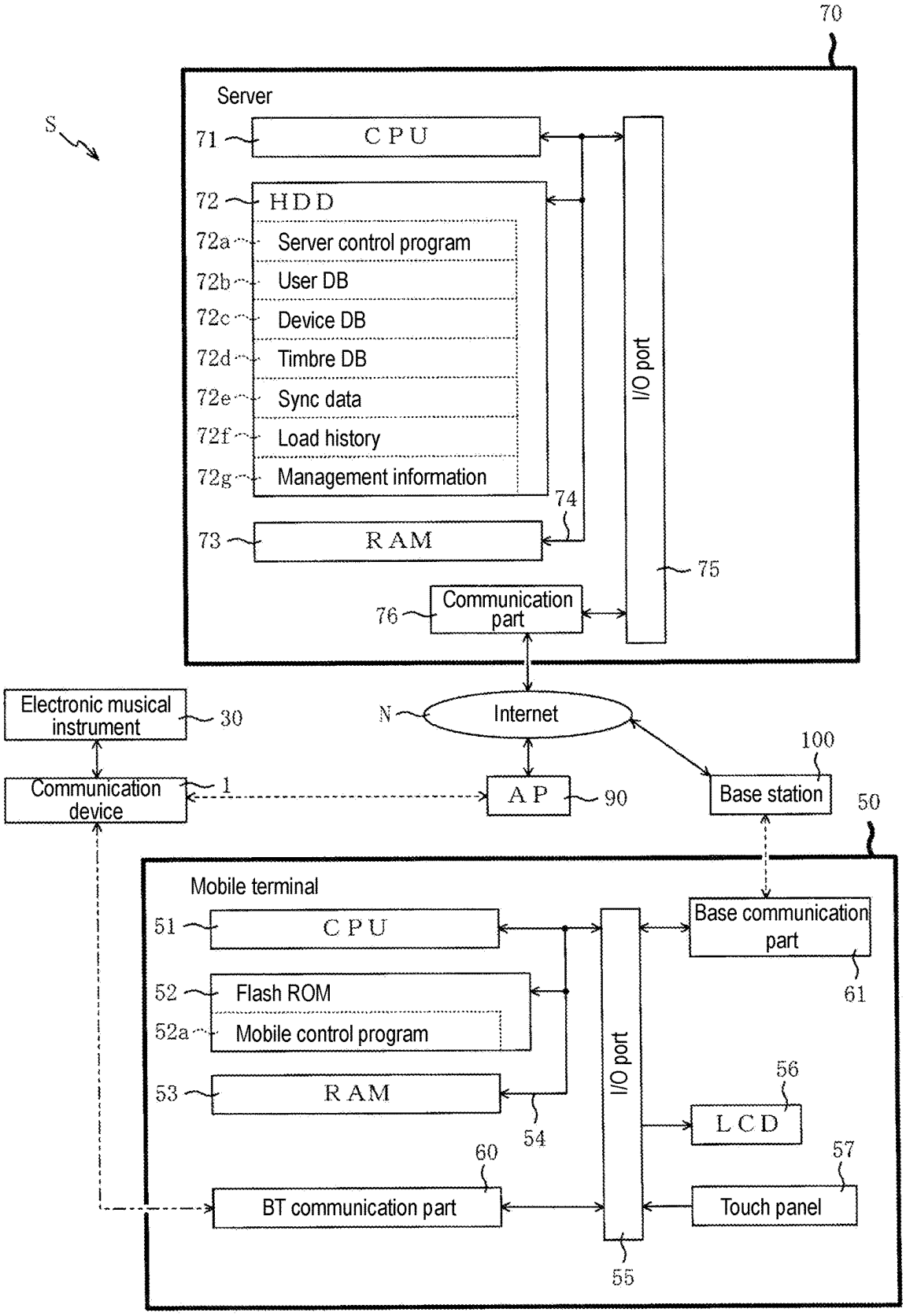
70
Server
S
71
CPU
72
HDD
72a
Server control program
72b
User DB
72c
Device DB
72d
Timbre DB
72e
Sync data
72f
Load history
72g
Management information
74
73
RAM
I/O port
75
76
Communication part
Electronic musical instrument
30
N
Internet
100
Communication device
1
AP
90
Base station
50
Mobile terminal
51
CPU
Base communication part
61
52
Flash ROM
52a
Mobile control program
53
RAM
54
I/O port
56
LCD
60
57
BT communication part
Touch panel
55

FIG. 11

User DB 72b

No.	Account	Password	User identifier
1	ABC@PPP. com	*********	AAAA
2	DEF@PPP. com	*********	AAAB
:	:	:	:

FIG. 12A

User DB 72c

NO.	Device identifier	Product info	User identifier
1	0001	p0001	AAAA
2	0002	p0002	AAAB
:	:	:	:
100	0100	–	–
:	:	:	:

FIG. 12B

Sync data 72e

No.	User identifier	Device identifier	Identifier of data	Attribute information of data
1	AAAA	0001	SD_A	P_SD_A
2			WV_D	P_WV_D
:			:	:
20	AAAB	0021	SD_C	P_SD_C
21			WV_G	P_WV_G
:			:	:
25		0023	SD_B	P_SD_B
:			:	:
:		:	:	:
:	:	:	:	:

FIG. 12C

Load history 72f

No.	User identifier	Identifier of timbre data	Load count
1	AAAA	SD_A	10
2		SD_B	12
:		:	:
20	AAAB	SD_A	29
:		:	:
:	:	:	:

FIG. 12D

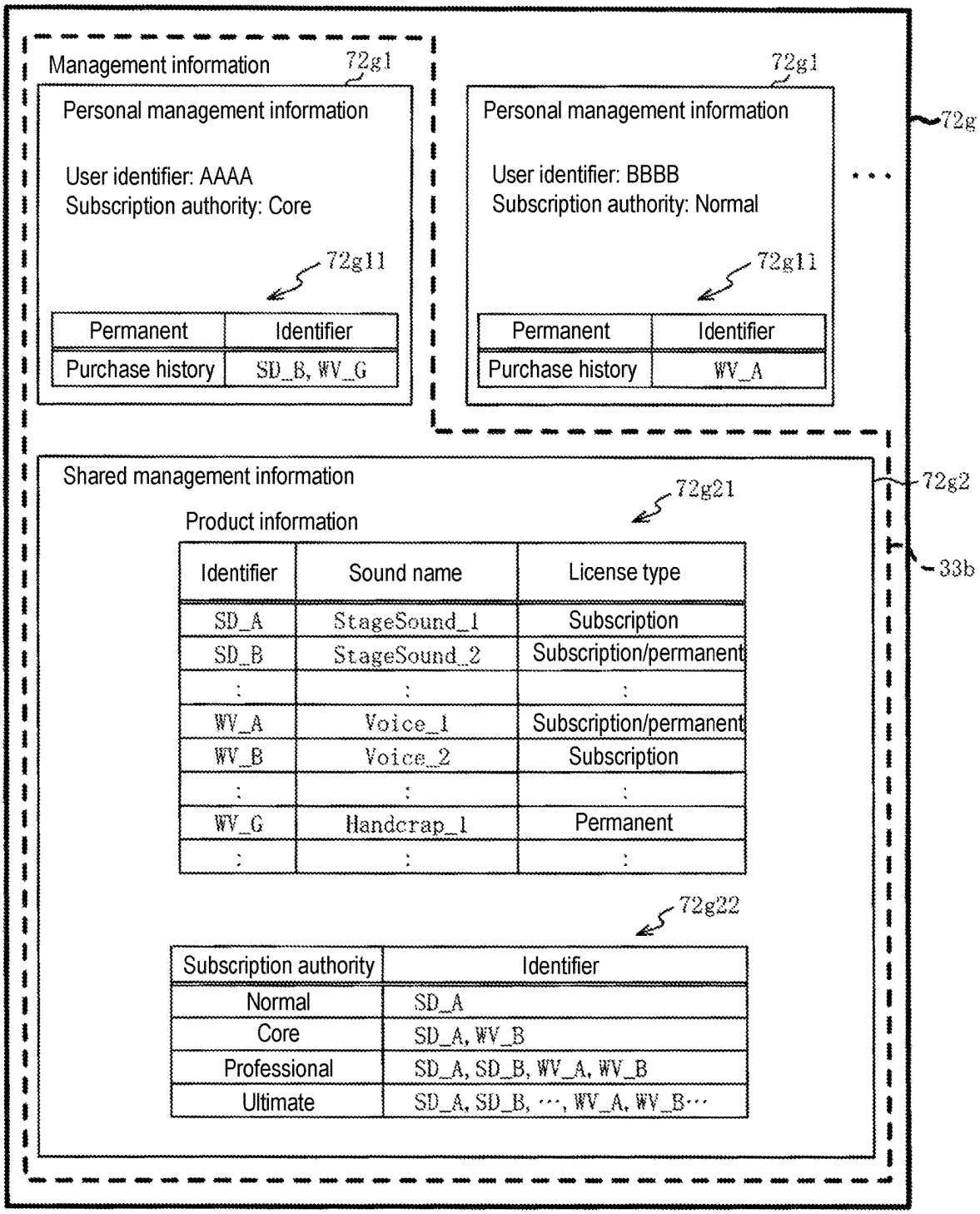
Management information
72g1
Personal management information
User identifier: AAAA
Subscription authority: Core
72g11
Permanent
Identifier
Purchase history
SD_B, WV_G
72g1
Personal management information
User identifier: BBBB
Subscription authority: Normal
72g11
Permanent
Identifier
Purchase history
WV_A
72g
Shared management information
72g2
72g21
Product information
33b
Identifier
Sound name
License type
SD_A
StageSound_1
Subscription
SD_B
StageSound_2
Subscription/permanent
WV_A
Voice_1
Subscription/permanent
WV_B
Voice_2
Subscription
WV_G
Handcrap_1
Permanent
72g22
Subscription authority
Identifier
Normal
SD_A
Core
SD_A, WV_B
Professional
SD_A, SD_B, WV_A, WV_B
Ultimate
SD_A, SD_B, ···, WV_A, WV_B···

FIG. 13

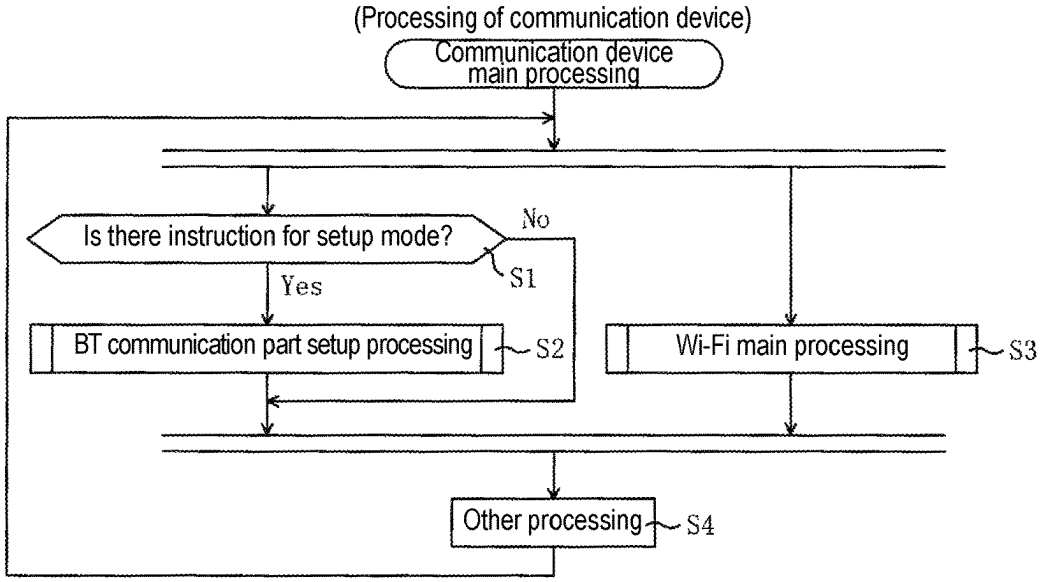

FIG. 14A

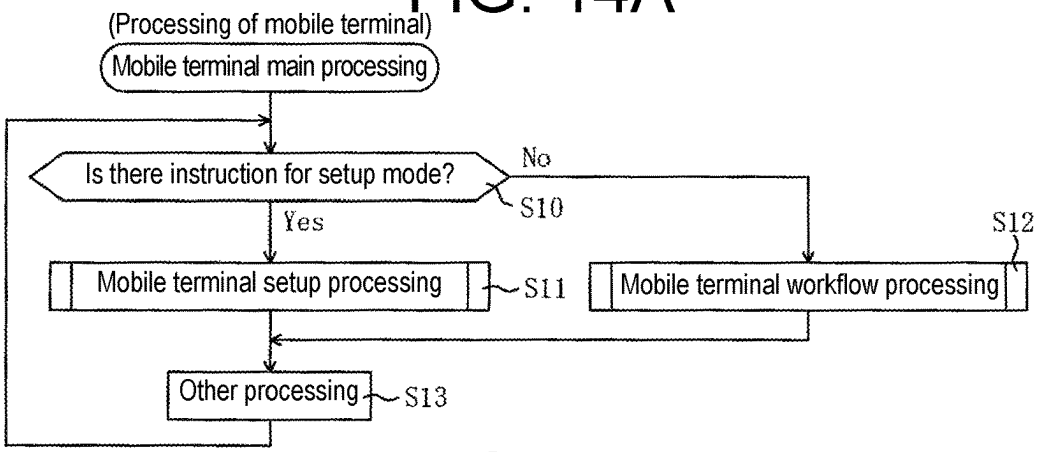

FIG. 14B

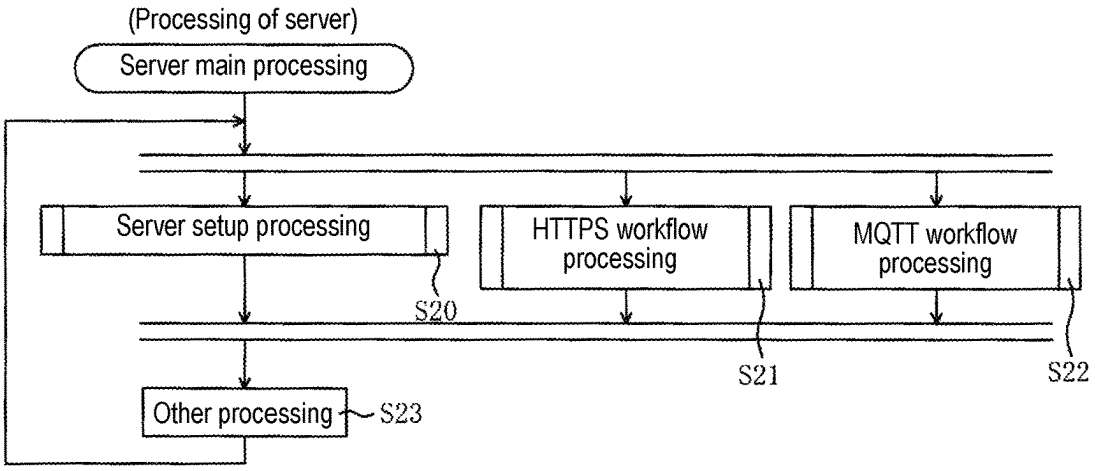

FIG. 14C

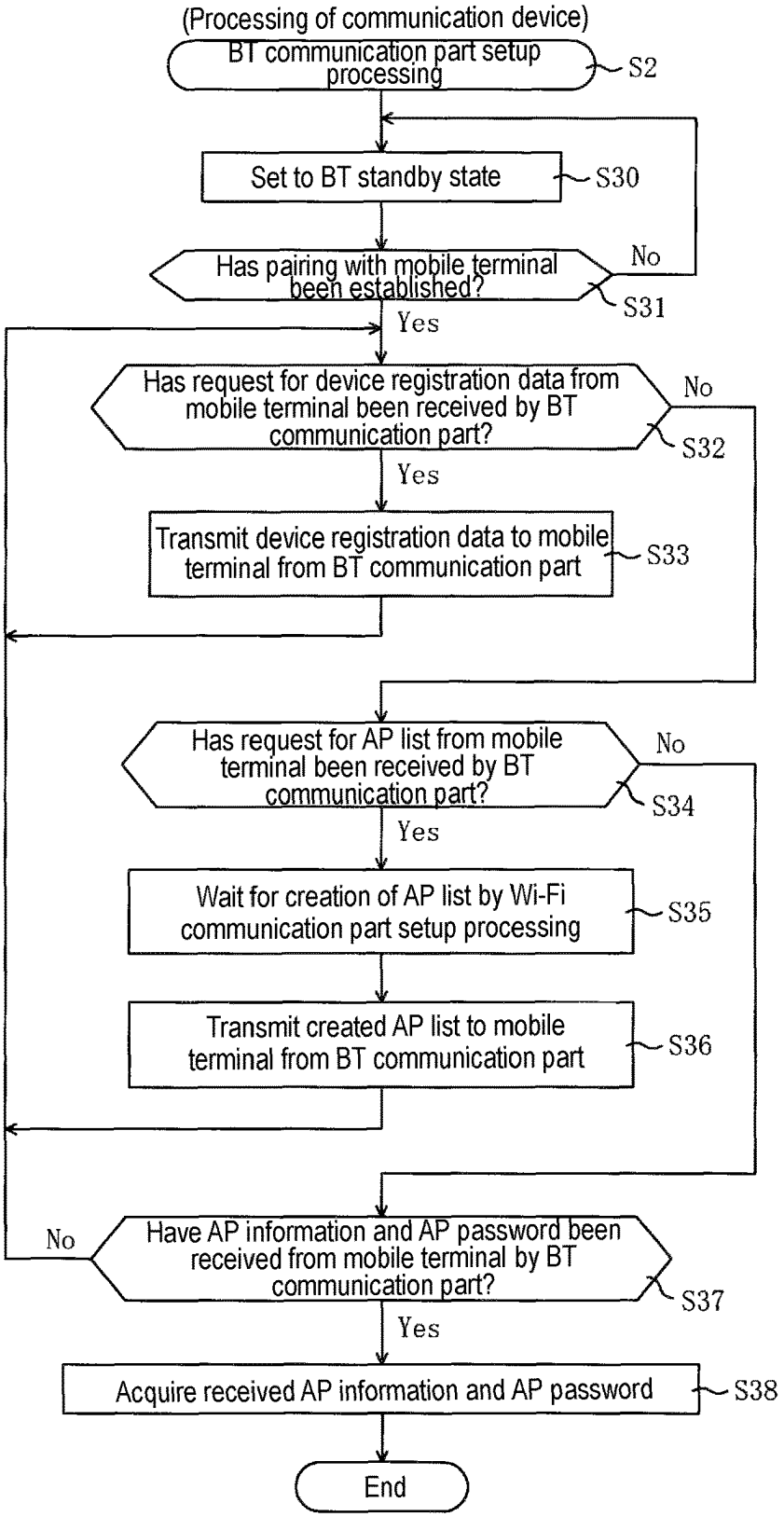
(Processing of communication device)
BT communication part setup processing
S2
Set to BT standby state
S30
Has pairing with mobile terminal been established?
No
S31
Yes
Has request for device registration data from mobile terminal been received by BT communication part?
No
S32
Yes
Transmit device registration data to mobile terminal from BT communication part
S33
Has request for AP list from mobile terminal been received by BT communication part?
No
S34
Yes
Wait for creation of AP list by Wi-Fi communication part setup processing
S35
Transmit created AP list to mobile terminal from BT communication part
S36
No
Have AP information and AP password been received from mobile terminal by BT communication part?
S37
Yes
Acquire received AP information and AP password
S38
End

FIG. 15

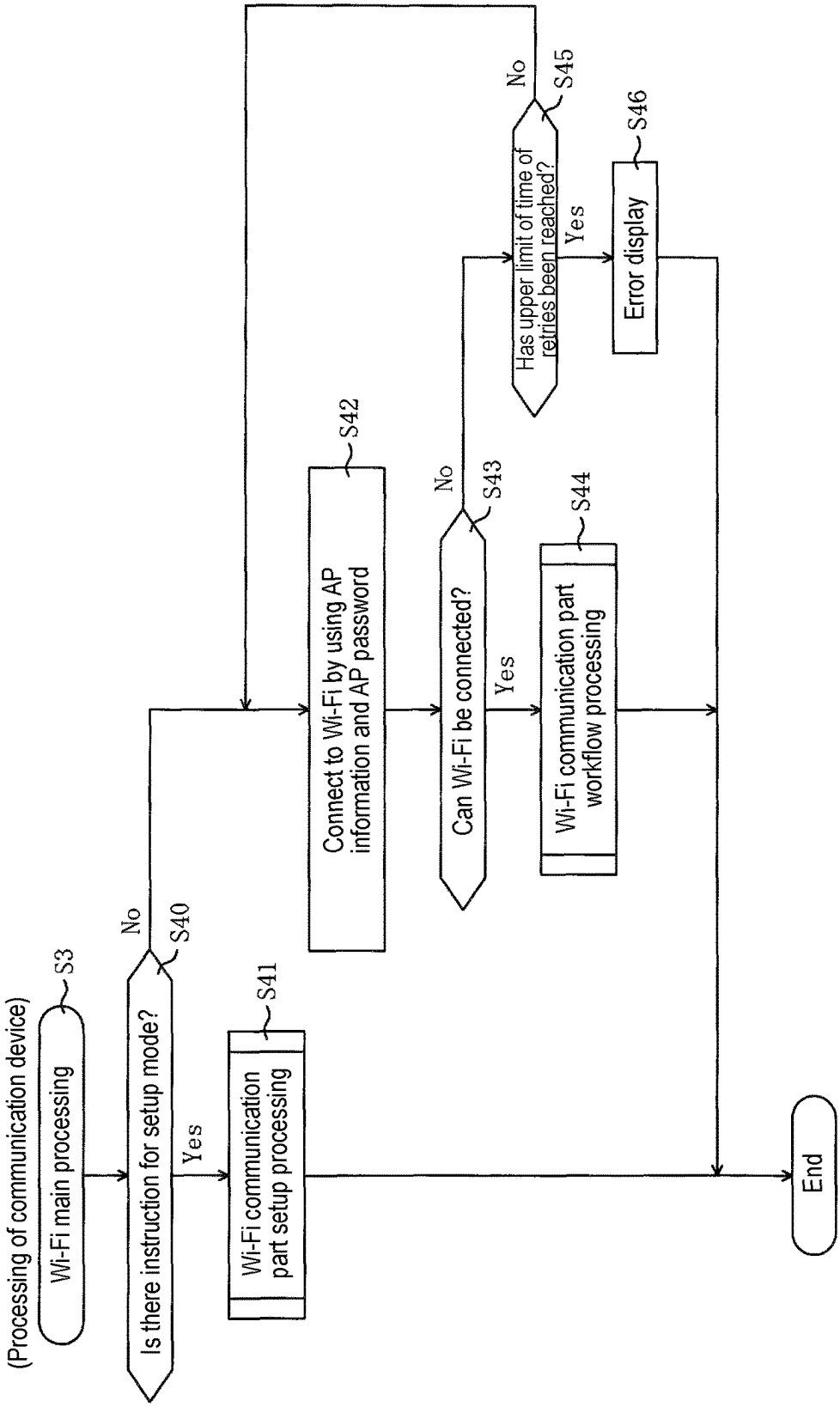
(Processing of communication device)
S3
Wi-Fi main processing
S40
Is there instruction for setup mode?
No
Yes
S41
Wi-Fi communication part setup processing
S42
Connect to Wi-Fi by using AP information and AP password
S43
Can Wi-Fi be connected?
No
Yes
S44
Wi-Fi communication part workflow processing
S45
Has upper limit of time of retries been reached?
No
Yes
S46
Error display
End

FIG. 16

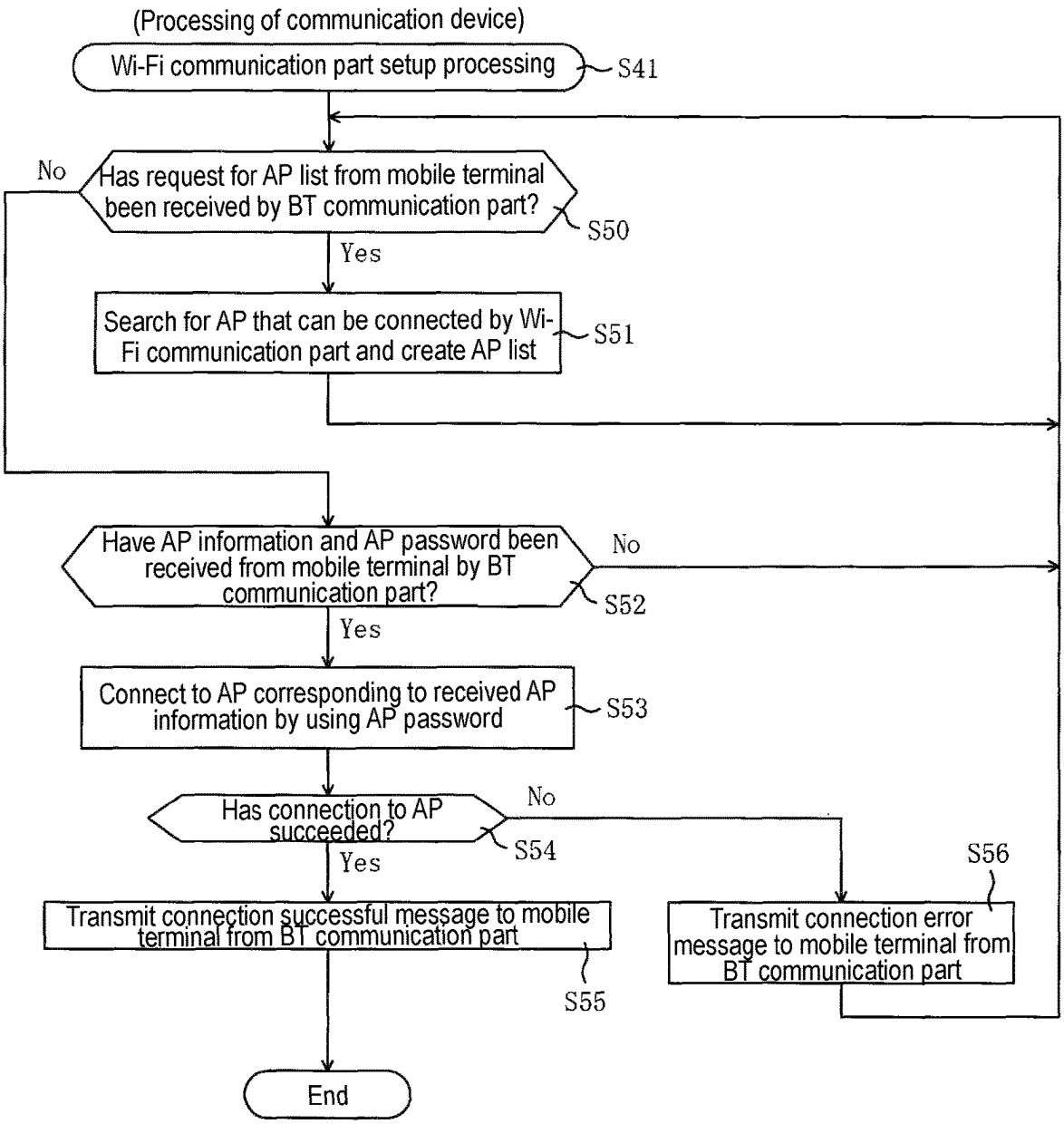
(Processing of communication device)
Wi-Fi communication part setup processing
S41
Has request for AP list from mobile terminal been received by BT communication part?
S50
No
Yes
Search for AP that can be connected by Wi-Fi communication part and create AP list
S51
Have AP information and AP password been received from mobile terminal by BT communication part?
S52
No
Yes
Connect to AP corresponding to received AP information by using AP password
S53
Has connection to AP succeeded?
S54
No
Yes
Transmit connection successful message to mobile terminal from BT communication part
S55
Transmit connection error message to mobile terminal from BT communication part
S56
End

FIG. 17

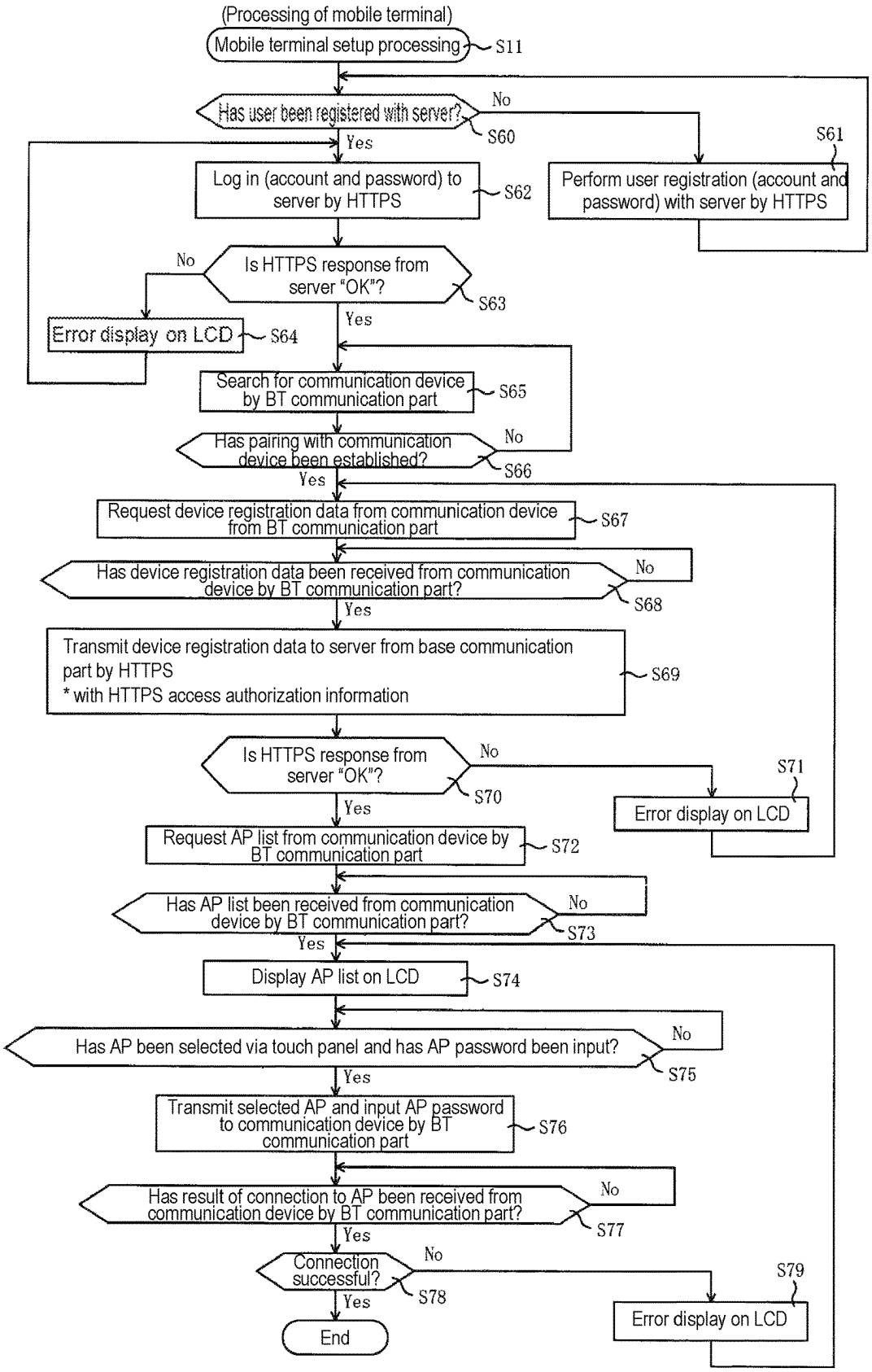
(Processing of mobile terminal)
Mobile terminal setup processing
S11
Has user been registered with server?
S60
No
Yes
S61
Log in (account and password) to server by HTTPS
S62
Perform user registration (account and password) with server by HTTPS
Is HTTPS response from server "OK"?
S63
No
Yes
Error display on LCD
S64
Search for communication device by BT communication part
S65
Has pairing with communication device been established?
S66
No
Yes
Request device registration data from communication device from BT communication part
S67
Has device registration data been received from communication device by BT communication part?
S68
No
Yes
Transmit device registration data to server from base communication part by HTTPS
* with HTTPS access authorization information
S69
Is HTTPS response from server "OK"?
S70
No
Yes
S71
Error display on LCD
Request AP list from communication device by BT communication part
S72
Has AP list been received from communication device by BT communication part?
S73
No
Yes
Display AP list on LCD
S74
Has AP been selected via touch panel and has AP password been input?
S75
No
Yes
Transmit selected AP and input AP password to communication device by BT communication part
S76
Has result of connection to AP been received from communication device by BT communication part?
S77
No
Yes
Connection successful?
S78
No
Yes
S79
Error display on LCD
End

FIG. 18

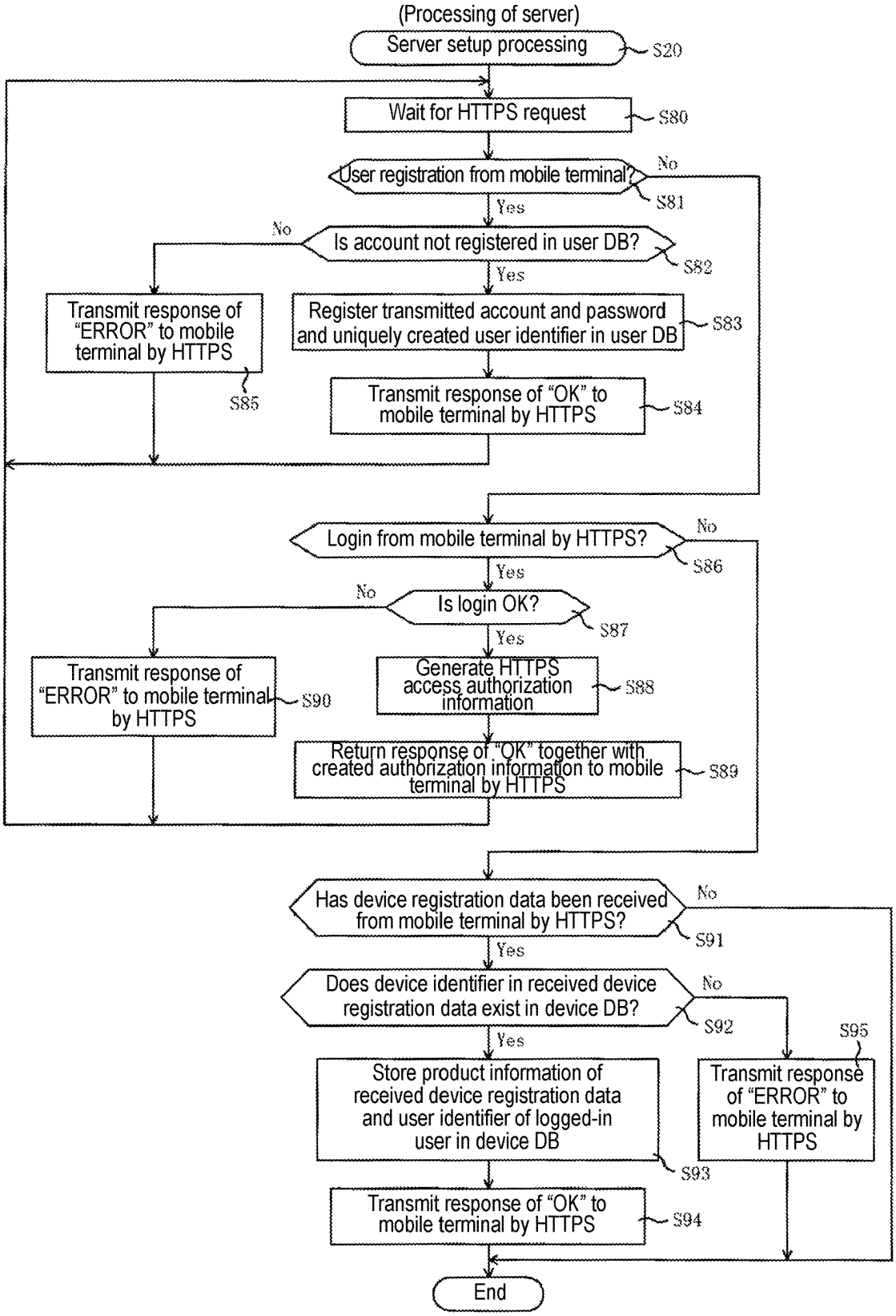
(Processing of server)
Server setup processing
S20
Wait for HTTPS request
S80
User registration from mobile terminal?
S81
No
Yes
Is account not registered in user DB?
S82
No
Yes
Transmit response of "ERROR" to mobile terminal by HTTPS
S85
Register transmitted account and password and uniquely created user identifier in user DB
S83
Transmit response of "OK" to mobile terminal by HTTPS
S84
Login from mobile terminal by HTTPS?
S86
No
Yes
Is login OK?
S87
No
Yes
Transmit response of "ERROR" to mobile terminal by HTTPS
S90
Generate HTTPS access authorization information
S88
Return response of "OK" together with created authorization information to mobile terminal by HTTPS
S89
Has device registration data been received from mobile terminal by HTTPS?
S91
No
Yes
Does device identifier in received device registration data exist in device DB?
S92
No
Yes
S95
Store product information of received device registration data and user identifier of logged-in user in device DB
S93
Transmit response of "ERROR" to mobile terminal by HTTPS
Transmit response of "OK" to mobile terminal by HTTPS
S94
End

FIG. 19

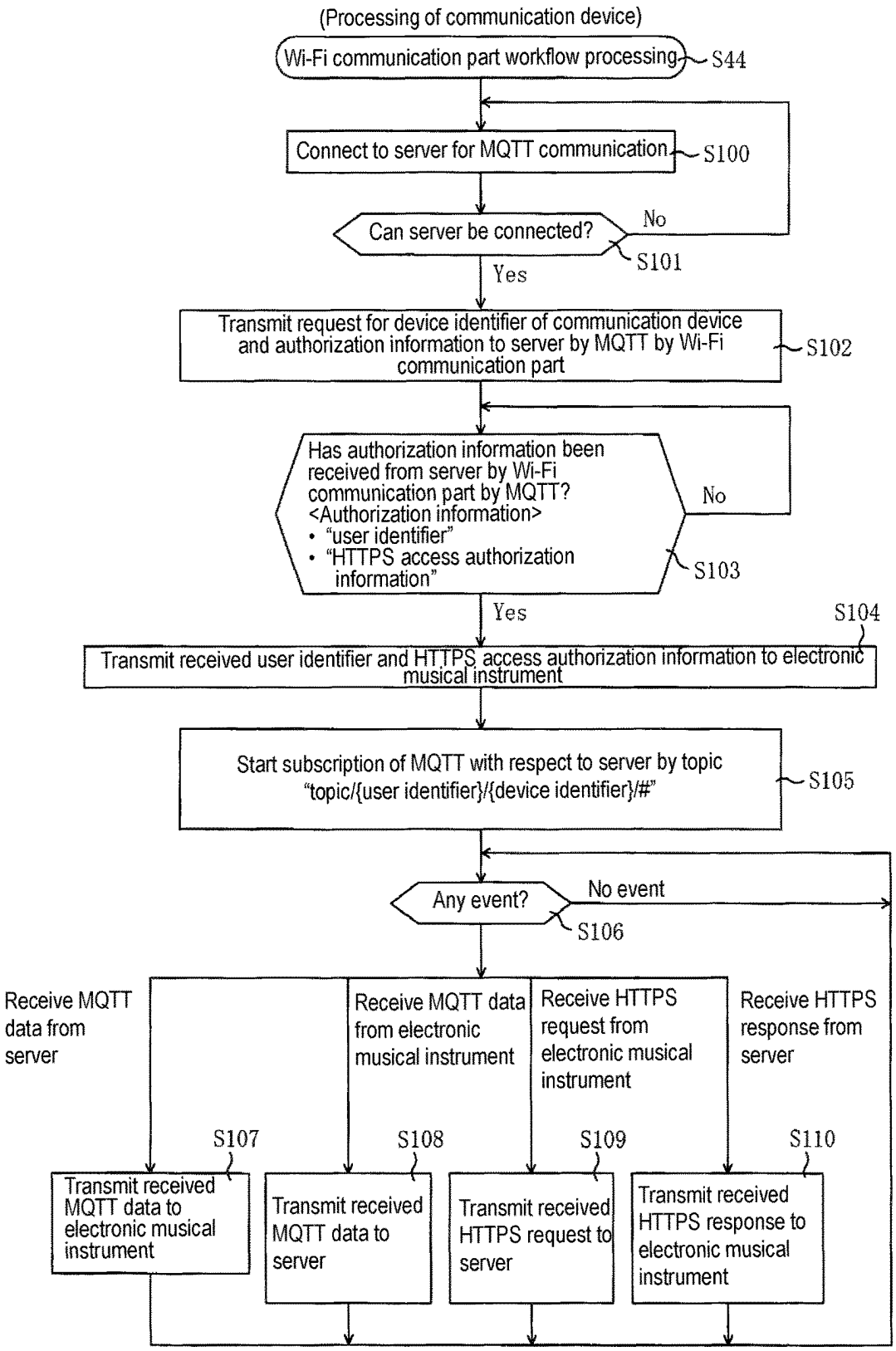
(Processing of communication device)
Wi-Fi communication part workflow processing
S44
Connect to server for MQTT communication
S100
Can server be connected?
No
S101
Yes
Transmit request for device identifier of communication device and authorization information to server by MQTT by Wi-Fi communication part
S102
Has authorization information been received from server by Wi-Fi communication part by MQTT?
<Authorization information>
• "user identifier"
• "HTTPS access authorization information"
No
S103
Yes
S104
Transmit received user identifier and HTTPS access authorization information to electronic musical instrument
Start subscription of MQTT with respect to server by topic "topic/{user identifier}/{device identifier}/#"
S105
Any event?
No event
S106
Receive MQTT data from server
Receive MQTT data from electronic musical instrument
Receive HTTPS request from electronic musical instrument
Receive HTTPS response from server
S107
S108
S109
S110
Transmit received MQTT data to electronic musical instrument
Transmit received MQTT data to server
Transmit received HTTPS request to server
Transmit received HTTPS response to electronic musical instrument

FIG. 20

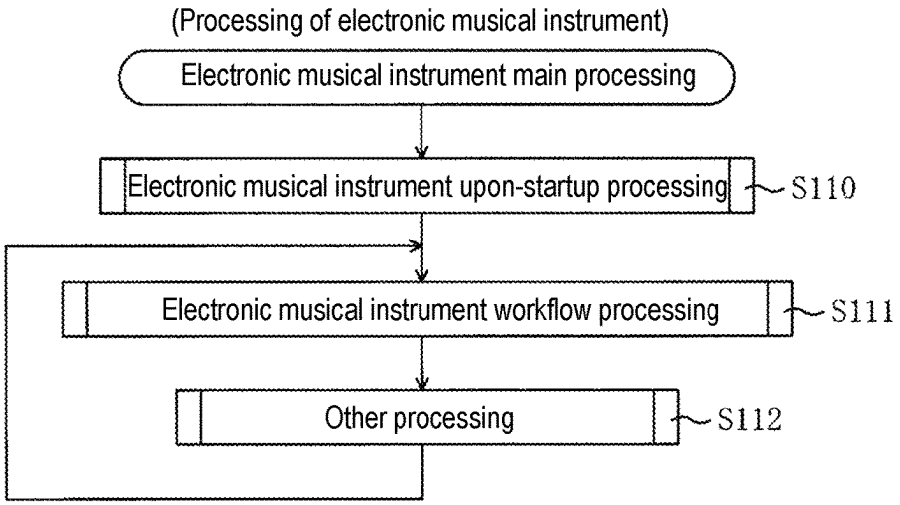

FIG. 21A

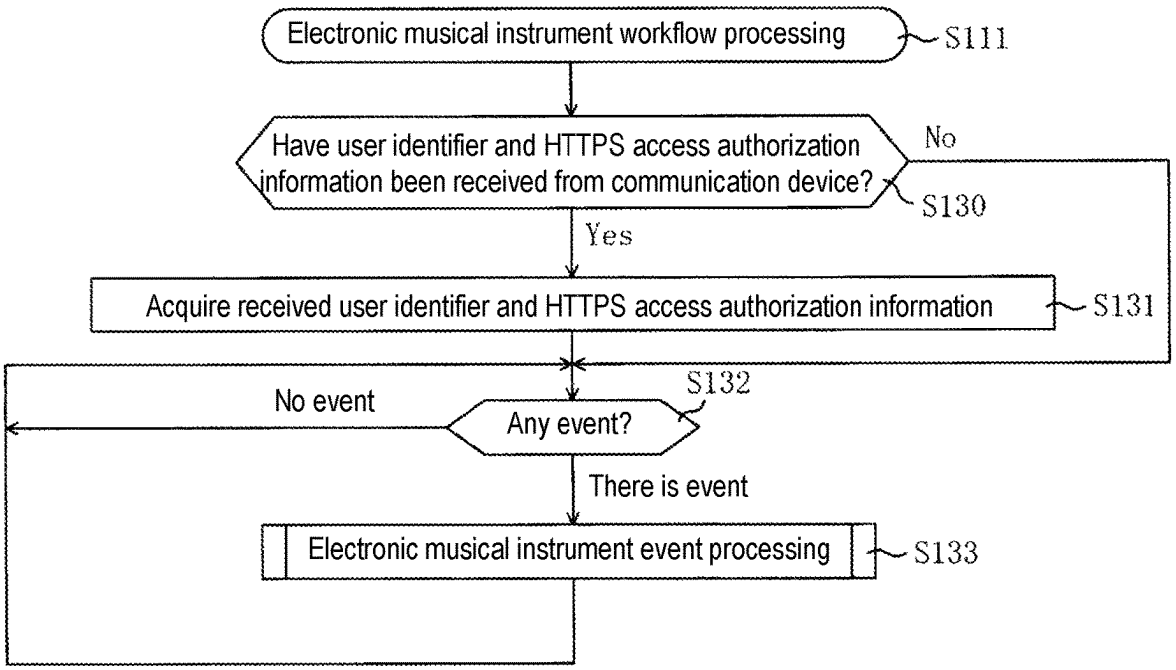

FIG. 21B

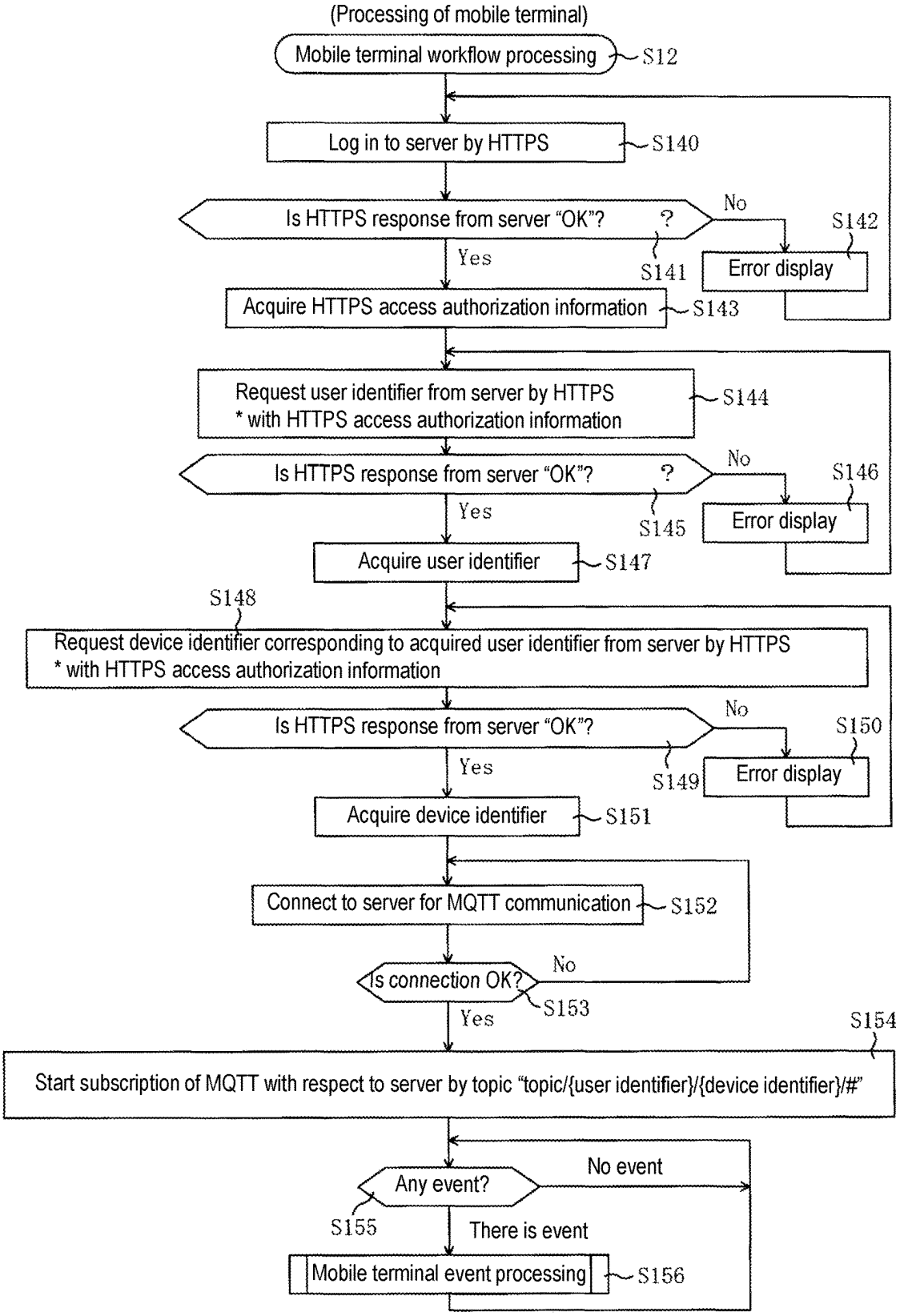
(Processing of mobile terminal)
Mobile terminal workflow processing
S12
Log in to server by HTTPS
S140
Is HTTPS response from server "OK"?
?
S141
No
S142
Error display
Yes
Acquire HTTPS access authorization information
S143
Request user identifier from server by HTTPS
* with HTTPS access authorization information
S144
Is HTTPS response from server "OK"?
?
S145
No
S146
Error display
Yes
Acquire user identifier
S147
S148
Request device identifier corresponding to acquired user identifier from server by HTTPS
* with HTTPS access authorization information
Is HTTPS response from server "OK"?
S149
No
S150
Error display
Yes
Acquire device identifier
S151
Connect to server for MQTT communication
S152
Is connection OK?
S153
No
Yes
S154
Start subscription of MQTT with respect to server by topic "topic/{user identifier}/{device identifier}/#"
Any event?
S155
No event
There is event
Mobile terminal event processing
S156

FIG. 22

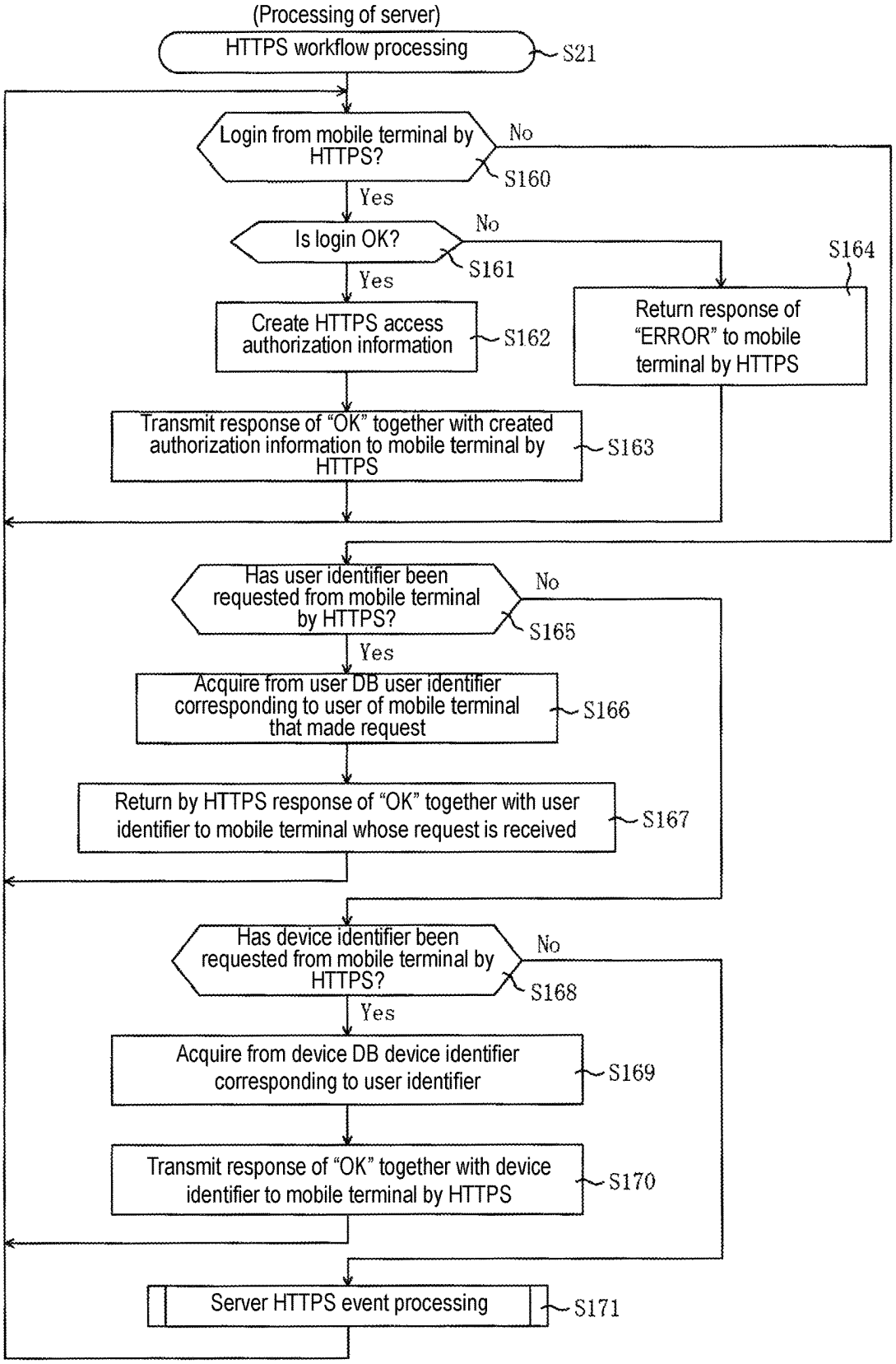
(Processing of server)
HTTPS workflow processing
S21
Login from mobile terminal by HTTPS?
No
S160
Yes
Is login OK?
No
S161
Yes
S164
Create HTTPS access authorization information
S162
Return response of "ERROR" to mobile terminal by HTTPS
Transmit response of "OK" together with created authorization information to mobile terminal by HTTPS
S163
Has user identifier been requested from mobile terminal by HTTPS?
No
S165
Yes
Acquire from user DB user identifier corresponding to user of mobile terminal that made request
S166
Return by HTTPS response of "OK" together with user identifier to mobile terminal whose request is received
S167
Has device identifier been requested from mobile terminal by HTTPS?
No
S168
Yes
Acquire from device DB device identifier corresponding to user identifier
S169
Transmit response of "OK" together with device identifier to mobile terminal by HTTPS
S170
Server HTTPS event processing
S171

FIG. 23

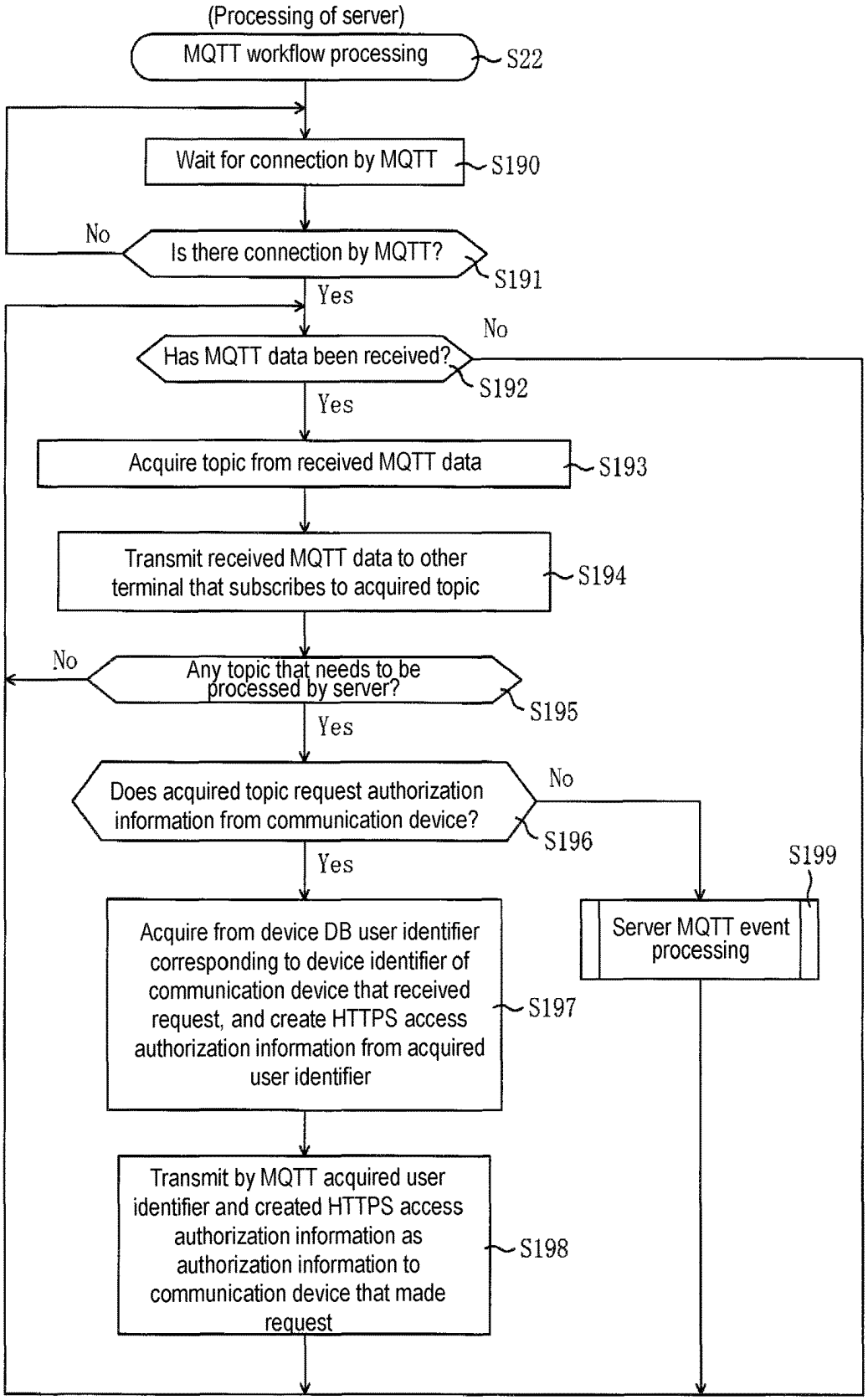
(Processing of server)
MQTT workflow processing
S22
Wait for connection by MQTT
S190
No
Is there connection by MQTT?
S191
Yes
No
Has MQTT data been received?
S192
Yes
Acquire topic from received MQTT data
S193
Transmit received MQTT data to other terminal that subscribes to acquired topic
S194
No
Any topic that needs to be processed by server?
S195
Yes
Does acquired topic request authorization information from communication device?
S196
No
Yes
S199
Server MQTT event processing
Acquire from device DB user identifier corresponding to device identifier of communication device that received request, and create HTTPS access authorization information from acquired user identifier
S197
Transmit by MQTT acquired user identifier and created HTTPS access authorization information as authorization information to communication device that made request
S198

FIG. 24

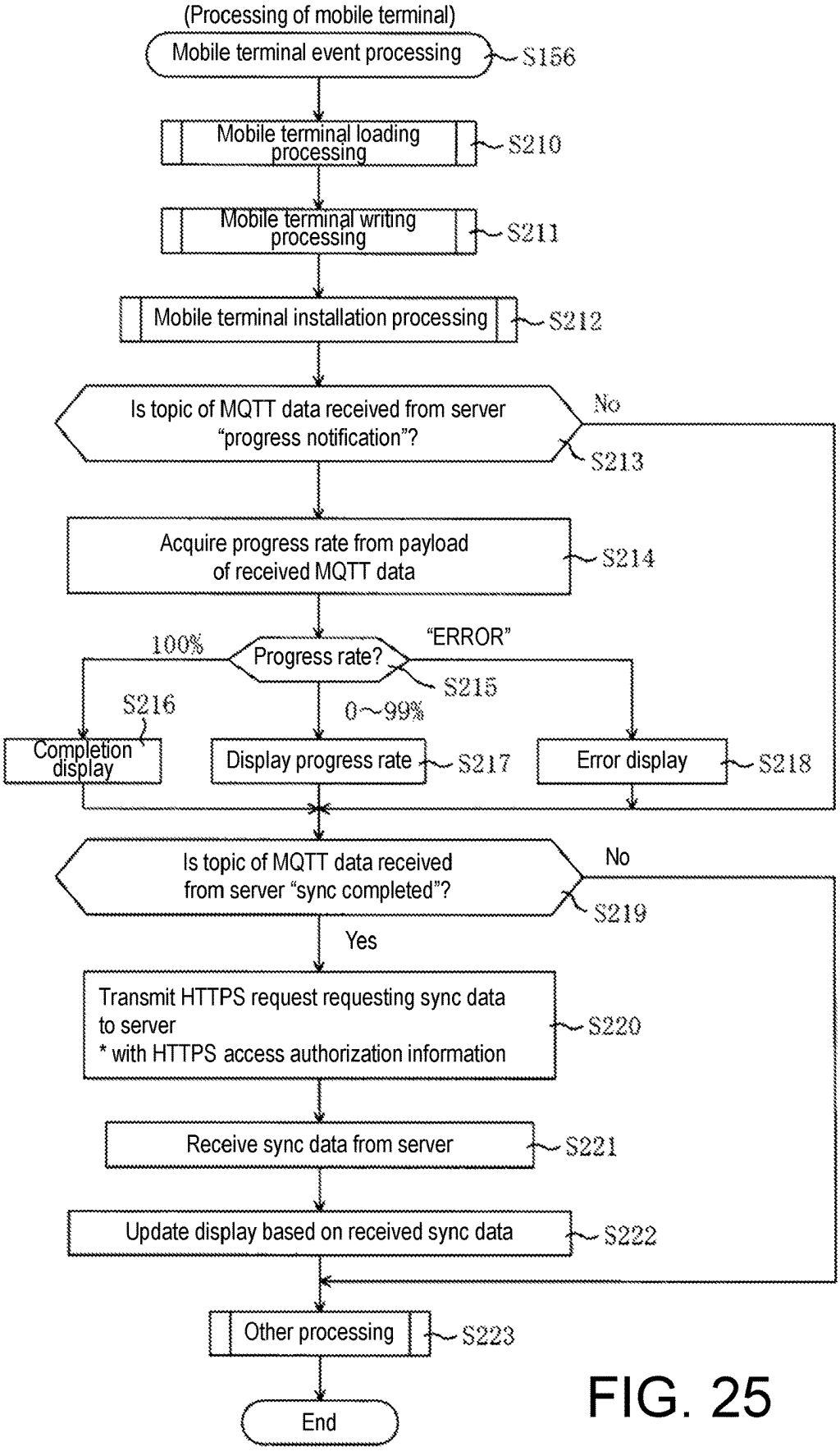
(Processing of mobile terminal)
Mobile terminal event processing
S156
Mobile terminal loading processing
S210
Mobile terminal writing processing
S211
Mobile terminal installation processing
S212
Is topic of MQTT data received from server "progress notification"?
No
S213
Acquire progress rate from payload of received MQTT data
S214
100%
Progress rate?
"ERROR"
S215
S216
0~99%
Completion display
Display progress rate
S217
Error display
S218
Is topic of MQTT data received from server "sync completed"?
No
S219
Yes
Transmit HTTPS request requesting sync data to server
* with HTTPS access authorization information
S220
Receive sync data from server
S221
Update display based on received sync data
S222
Other processing
S223
End

FIG. 25

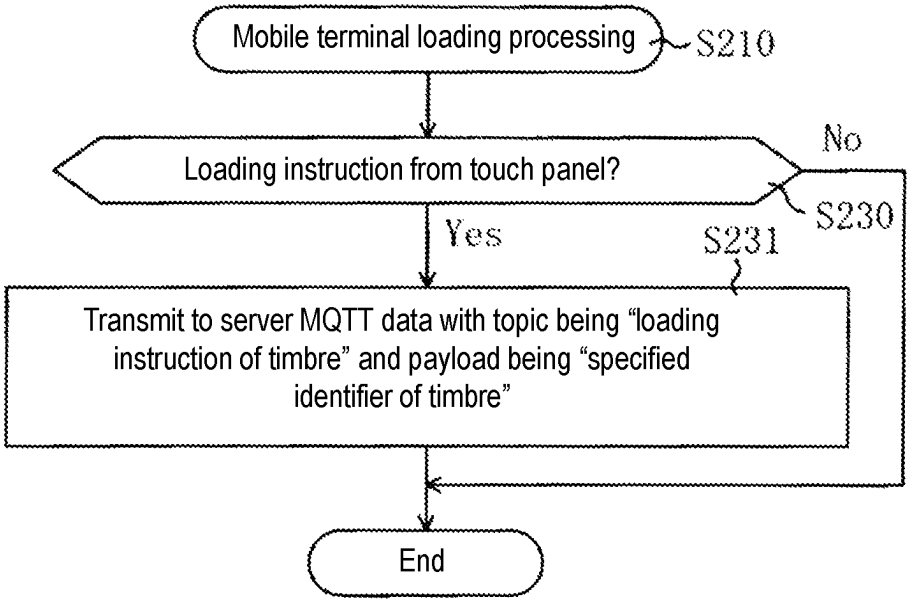

FIG. 26A

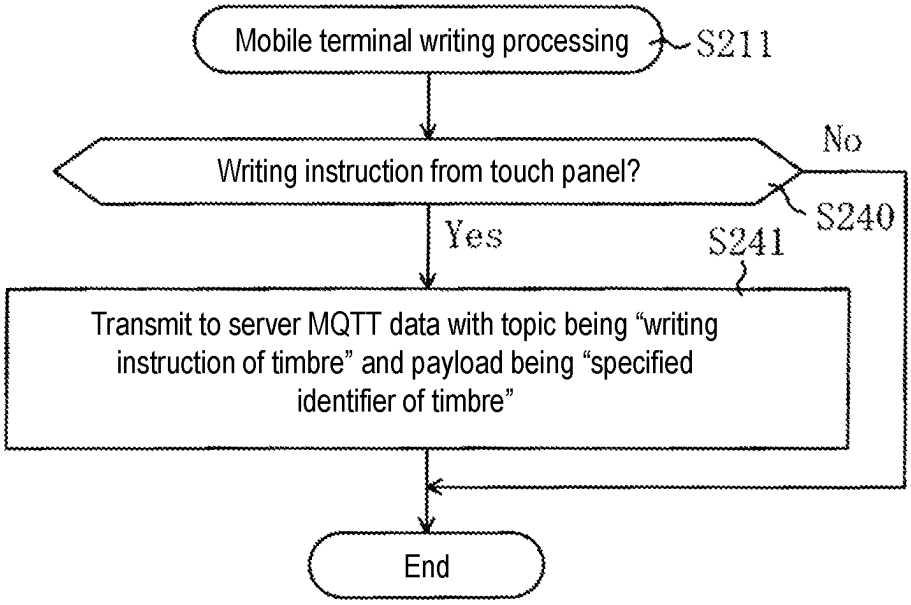

FIG. 26B

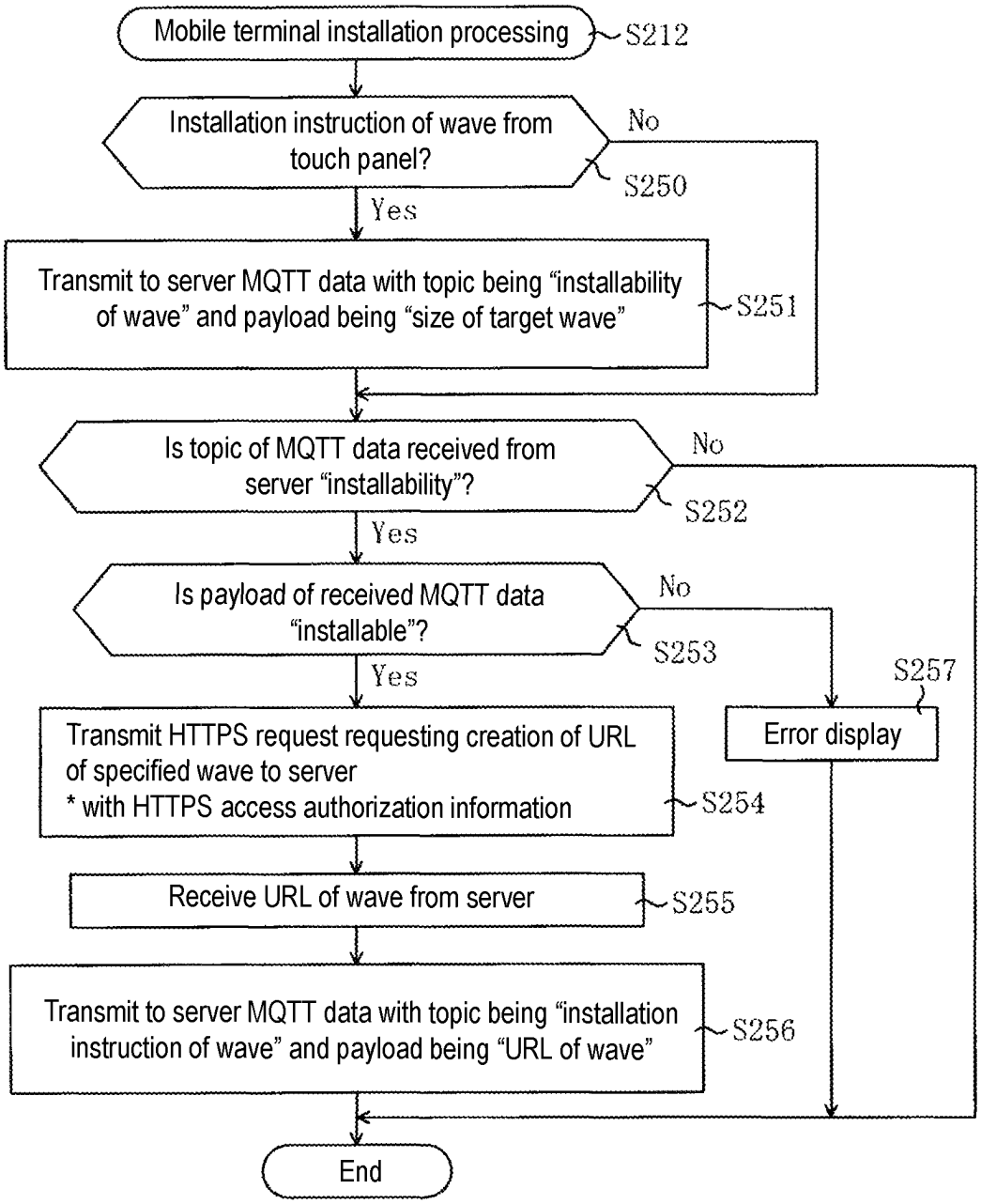
Mobile terminal installation processing
S212
Installation instruction of wave from touch panel?
No
S250
Yes
Transmit to server MQTT data with topic being "installability of wave" and payload being "size of target wave"
S251
Is topic of MQTT data received from server "installability"?
No
S252
Yes
Is payload of received MQTT data "installable"?
No
S253
Yes
S257
Error display
Transmit HTTPS request requesting creation of URL of specified wave to server
* with HTTPS access authorization information
S254
Receive URL of wave from server
S255
Transmit to server MQTT data with topic being "installation instruction of wave" and payload being "URL of wave"
S256
End

FIG. 26C

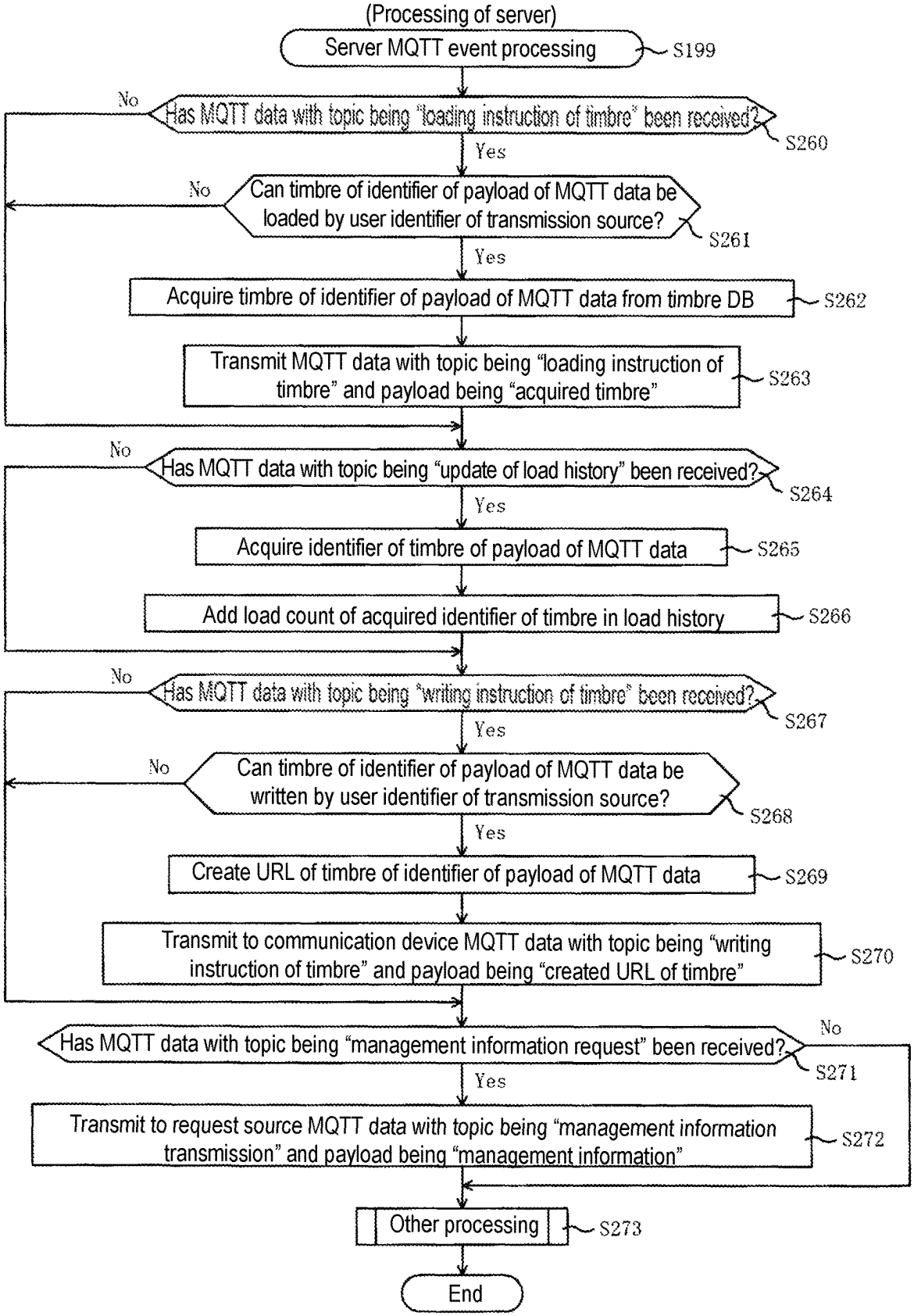
(Processing of server)
Server MQTT event processing
S199
Has MQTT data with topic being "loading instruction of timbre" been received?
S260
No
Yes
Can timbre of identifier of payload of MQTT data be loaded by user identifier of transmission source?
S261
No
Yes
Acquire timbre of identifier of payload of MQTT data from timbre DB
S262
Transmit MQTT data with topic being "loading instruction of timbre" and payload being "acquired timbre"
S263
Has MQTT data with topic being "update of load history" been received?
S264
No
Yes
Acquire identifier of timbre of payload of MQTT data
S265
Add load count of acquired identifier of timbre in load history
S266
Has MQTT data with topic being "writing instruction of timbre" been received?
S267
No
Yes
Can timbre of identifier of payload of MQTT data be written by user identifier of transmission source?
S268
No
Yes
Create URL of timbre of identifier of payload of MQTT data
S269
Transmit to communication device MQTT data with topic being "writing instruction of timbre" and payload being "created URL of timbre"
S270
Has MQTT data with topic being "management information request" been received?
S271
No
Yes
Transmit to request source MQTT data with topic being "management information transmission" and payload being "management information"
S272
Other processing
S273
End

FIG. 27

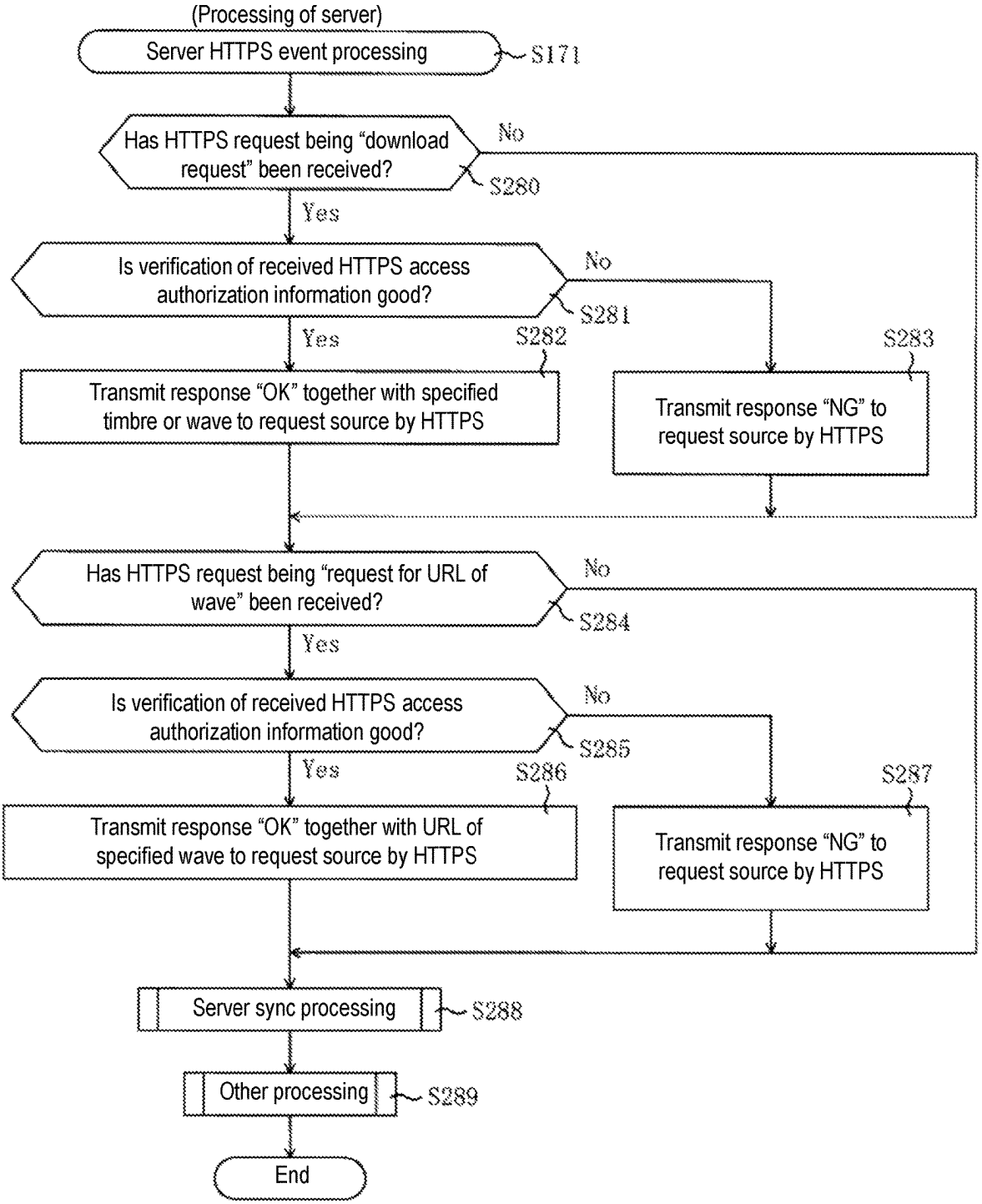
(Processing of server)
Server HTTPS event processing
S171
Has HTTPS request being "download request" been received?
No
S280
Yes
Is verification of received HTTPS access authorization information good?
No
S281
Yes
S282
S283
Transmit response "OK" together with specified timbre or wave to request source by HTTPS
Transmit response "NG" to request source by HTTPS
Has HTTPS request being "request for URL of wave" been received?
No
S284
Yes
Is verification of received HTTPS access authorization information good?
No
S285
Yes
S286
S287
Transmit response "OK" together with URL of specified wave to request source by HTTPS
Transmit response "NG" to request source by HTTPS
Server sync processing
S288
Other processing
S289
End

FIG. 28

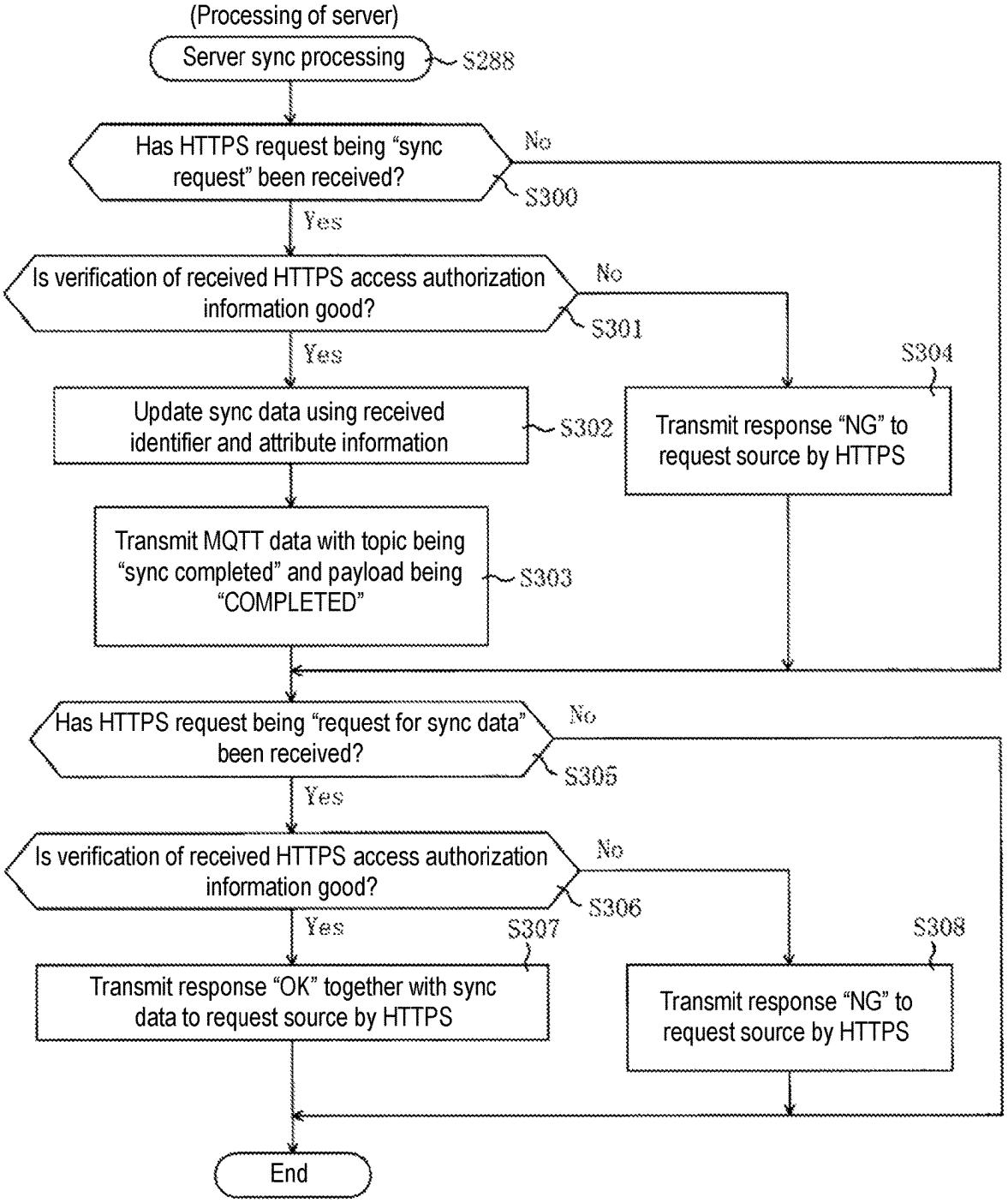
(Processing of server)
Server sync processing
S288
Has HTTPS request being "sync request" been received?
No
S300
Yes
Is verification of received HTTPS access authorization information good?
No
S301
Yes
S304
Update sync data using received identifier and attribute information
S302
Transmit response "NG" to request source by HTTPS
Transmit MQTT data with topic being "sync completed" and payload being "COMPLETED"
S303
Has HTTPS request being "request for sync data" been received?
No
S305
Yes
Is verification of received HTTPS access authorization information good?
No
S306
Yes
S307
S308
Transmit response "OK" together with sync data to request source by HTTPS
Transmit response "NG" to request source by HTTPS
End

FIG. 29

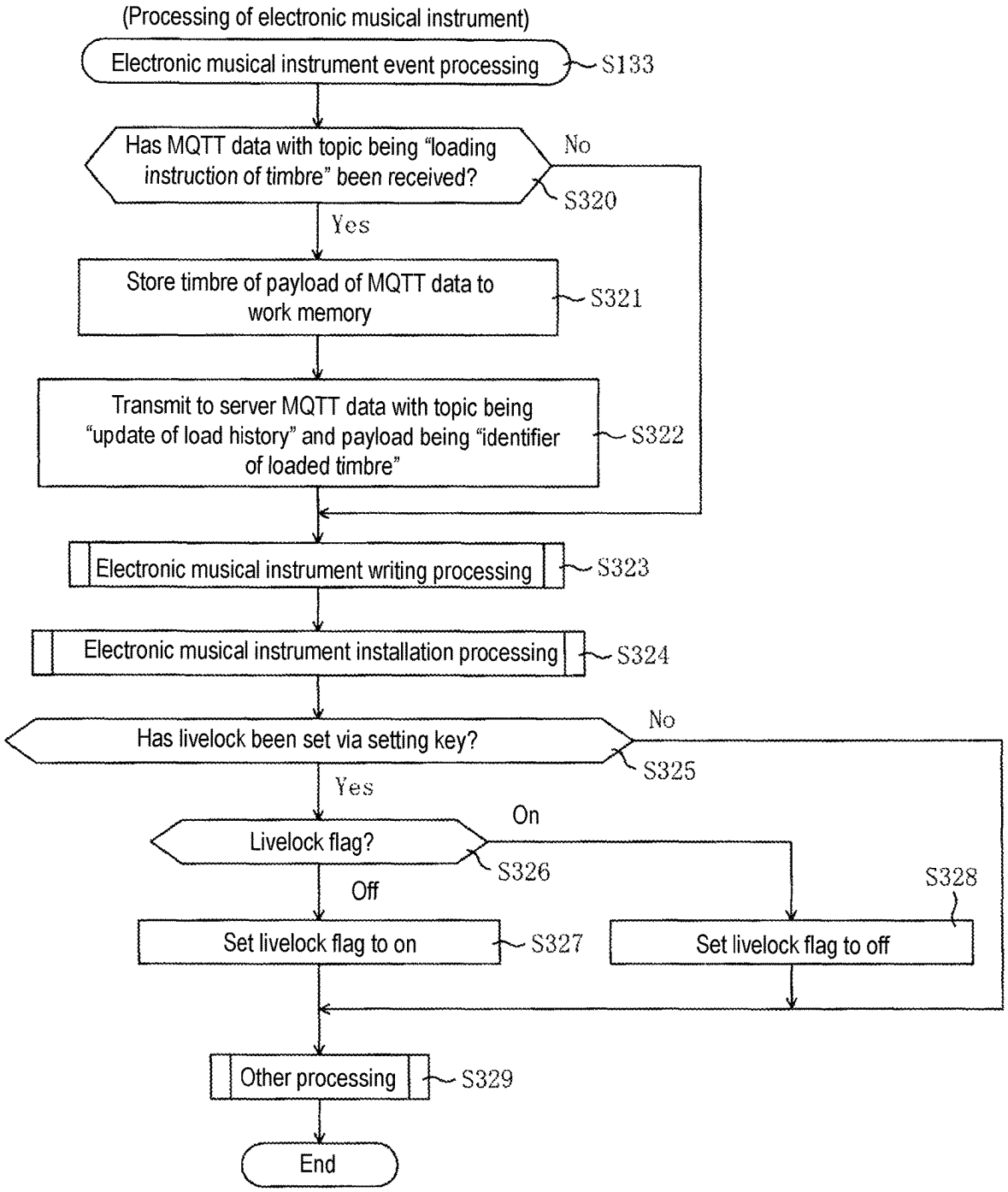
(Processing of electronic musical instrument)
Electronic musical instrument event processing
S133
Has MQTT data with topic being "loading instruction of timbre" been received?
No
S320
Yes
Store timbre of payload of MQTT data to work memory
S321
Transmit to server MQTT data with topic being "update of load history" and payload being "identifier of loaded timbre"
S322
Electronic musical instrument writing processing
S323
Electronic musical instrument installation processing
S324
Has livelock been set via setting key?
No
S325
Yes
Livelock flag?
On
S326
Off
S328
Set livelock flag to on
S327
Set livelock flag to off
Other processing
S329
End

FIG. 30

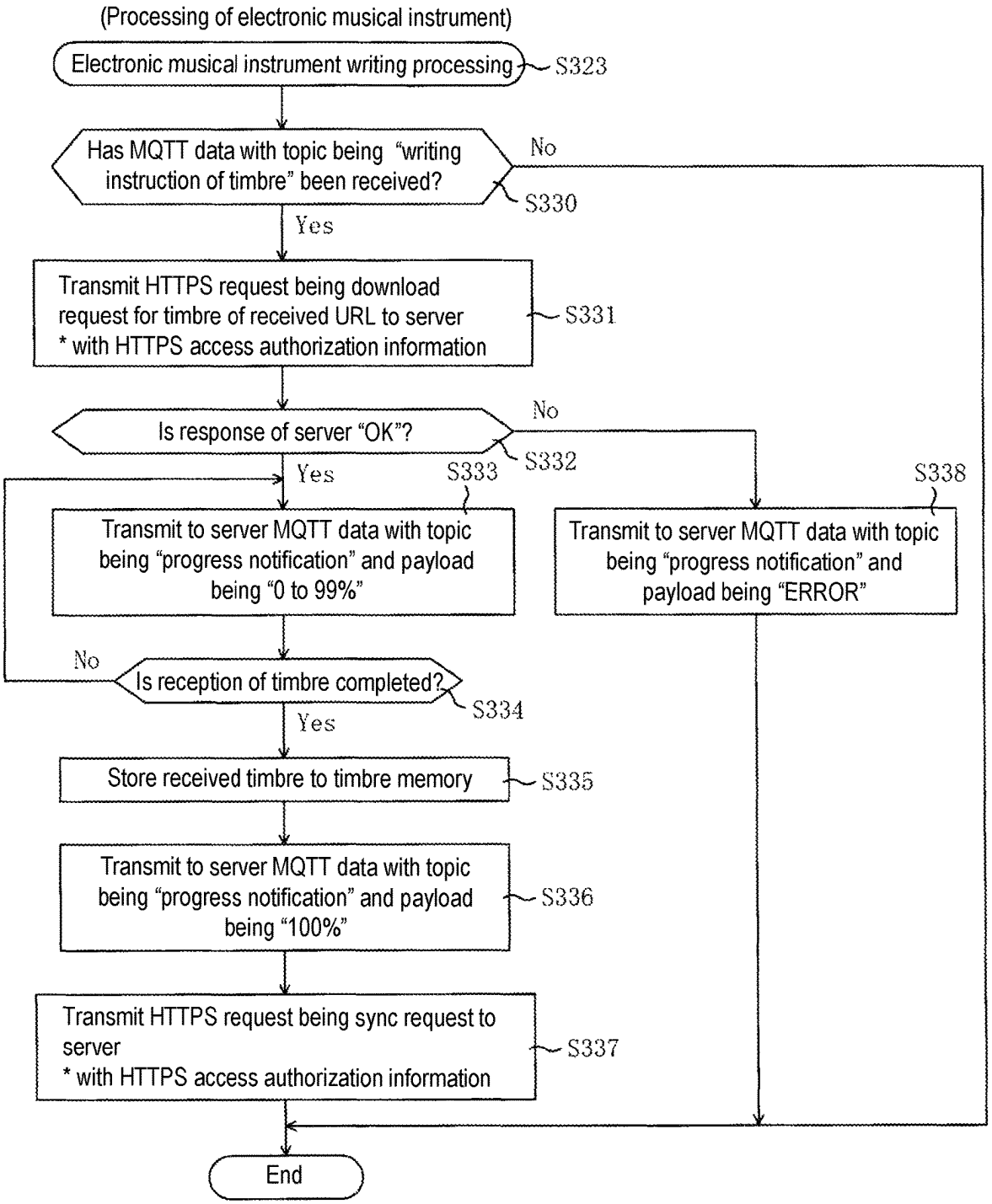
(Processing of electronic musical instrument)
Electronic musical instrument writing processing
S323
Has MQTT data with topic being "writing instruction of timbre" been received?
No
S330
Yes
Transmit HTTPS request being download request for timbre of received URL to server * with HTTPS access authorization information
S331
Is response of server "OK"?
No
S332
Yes
S333
S338
Transmit to server MQTT data with topic being "progress notification" and payload being "0 to 99%"
Transmit to server MQTT data with topic being "progress notification" and payload being "ERROR"
No
Is reception of timbre completed?
S334
Yes
Store received timbre to timbre memory
S335
Transmit to server MQTT data with topic being "progress notification" and payload being "100%"
S336
Transmit HTTPS request being sync request to server * with HTTPS access authorization information
S337
End

FIG. 31

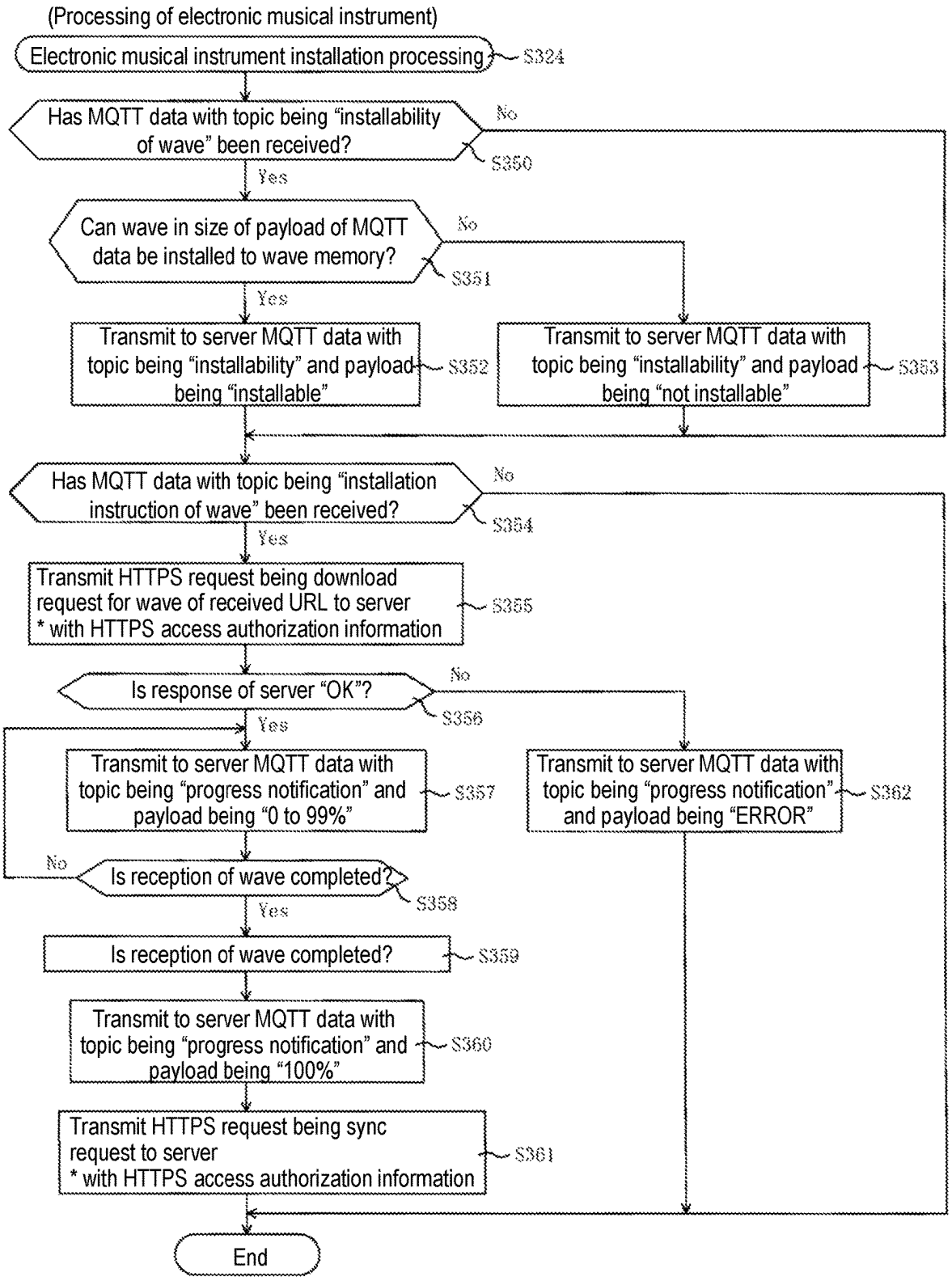
(Processing of electronic musical instrument)
Electronic musical instrument installation processing
S324
Has MQTT data with topic being "installability of wave" been received?
S350
No
Yes
Can wave in size of payload of MQTT data be installed to wave memory?
S351
No
Yes
Transmit to server MQTT data with topic being "installability" and payload being "installable"
S352
Transmit to server MQTT data with topic being "installability" and payload being "not installable"
S353
Has MQTT data with topic being "installation instruction of wave" been received?
S354
No
Yes
Transmit HTTPS request being download request for wave of received URL to server * with HTTPS access authorization information
S355
Is response of server "OK"?
S356
No
Yes
Transmit to server MQTT data with topic being "progress notification" and payload being "0 to 99%"
S357
Transmit to server MQTT data with topic being "progress notification" and payload being "ERROR"
S362
Is reception of wave completed?
S358
No
Yes
Is reception of wave completed?
S359
Transmit to server MQTT data with topic being "progress notification" and payload being "100%"
S360
Transmit HTTPS request being sync request to server * with HTTPS access authorization information
S361
End

FIG. 32

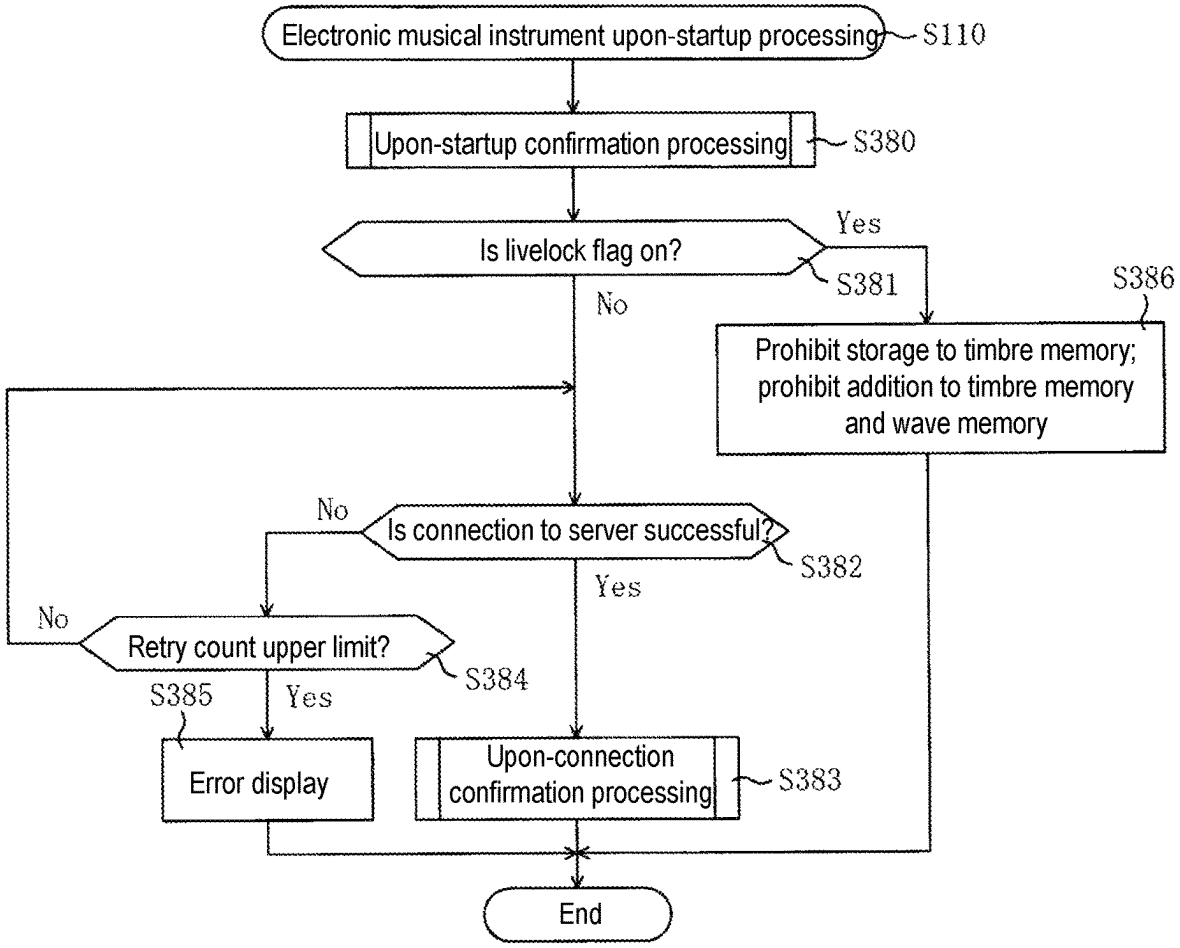
Electronic musical instrument upon-startup processing
S110
Upon-startup confirmation processing
S380
Is livelock flag on?
S381
Yes
No
S386
Prohibit storage to timbre memory; prohibit addition to timbre memory and wave memory
Is connection to server successful?
S382
No
Yes
Retry count upper limit?
S384
No
Yes
S385
Error display
Upon-connection confirmation processing
S383
End

FIG. 33

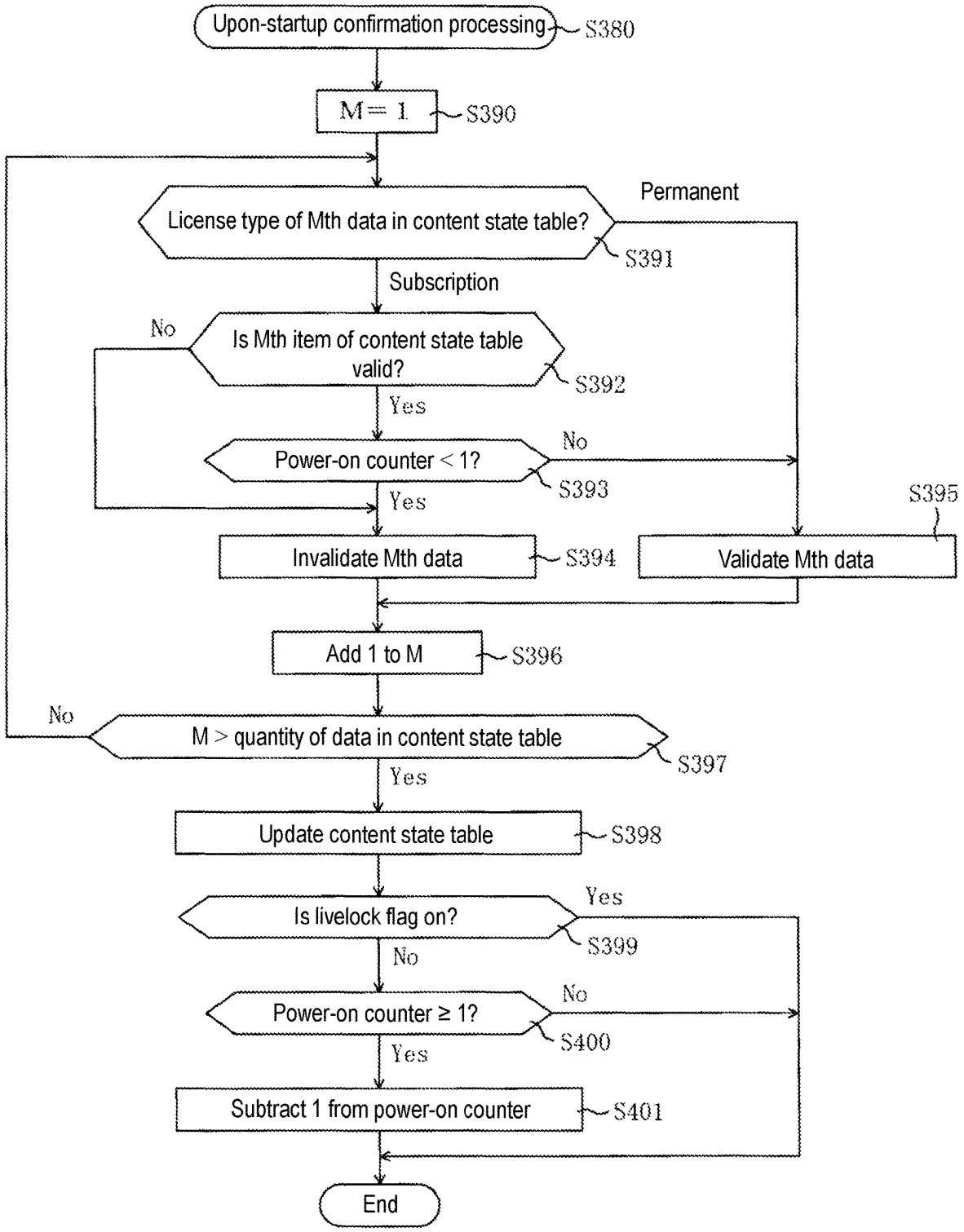
Upon-startup confirmation processing
S380
M = 1
S390
License type of Mth data in content state table?
Permanent
S391
Subscription
No
Is Mth item of content state table valid?
S392
Yes
Power-on counter < 1?
No
S393
Yes
S395
Invalidate Mth data
S394
Validate Mth data
Add 1 to M
S396
No
M > quantity of data in content state table
S397
Yes
Update content state table
S398
Yes
Is livelock flag on?
S399
No
No
Power-on counter ≥ 1?
S400
Yes
Subtract 1 from power-on counter
S401
End

FIG. 34

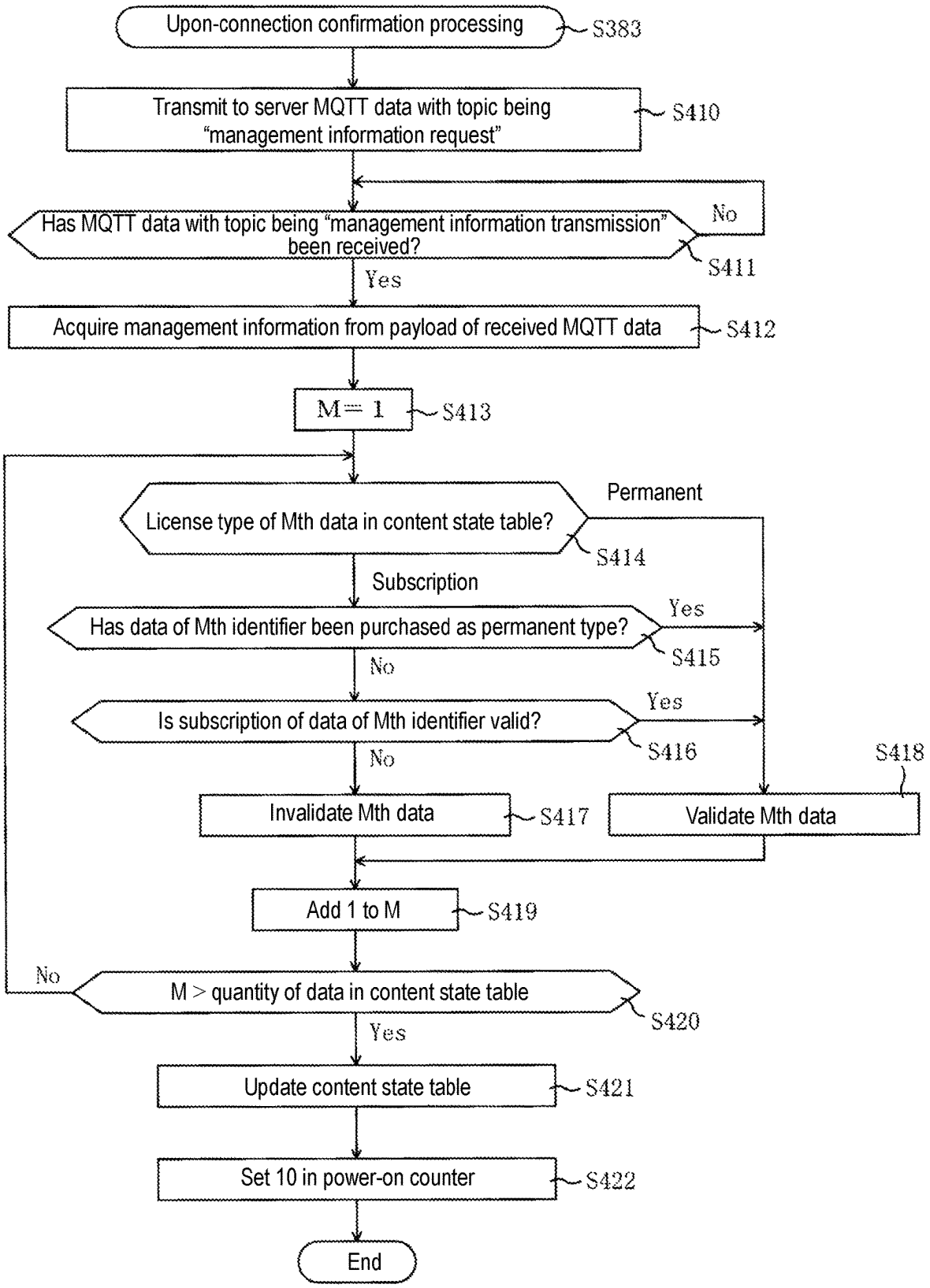
Upon-connection confirmation processing
S383
Transmit to server MQTT data with topic being "management information request"
S410
Has MQTT data with topic being "management information transmission" been received?
No
S411
Yes
Acquire management information from payload of received MQTT data
S412
M = 1
S413
License type of Mth data in content state table?
Permanent
S414
Subscription
Has data of Mth identifier been purchased as permanent type?
Yes
S415
No
Is subscription of data of Mth identifier valid?
Yes
S416
No
S418
Invalidate Mth data
S417
Validate Mth data
Add 1 to M
S419
No
M > quantity of data in content state table
S420
Yes
Update content state table
S421
Set 10 in power-on counter
S422
End

FIG. 35

ELECTRONIC DEVICE, DATA USAGE METHOD, AND RECORDING MEDIUM

CROSS-REFERENCE TO RELATED APPLICATION

This application claims the priority benefit of Japan application serial no. 2021-182814, filed on Nov. 9, 2021. The entirety of the above-mentioned patent application is hereby incorporated by reference herein and made a part of this specification.

BACKGROUND

Technical Field

The disclosure relates to an electronic device, a data usage method, and a recording medium.

Related Art

Patent Document 1 (Japanese Patent Application Laid-open No. 2021-177219) discloses a PC 30 which puts on a performance using permanent-type sound data permitted to be used permanently upon purchase of a user, and subscription-type sound data permitted to be used within a predetermined period upon purchase of the user.

However, in an electronic musical instrument 50 of Patent Document 1, while the permanent-type sound data can be used, the subscription-type sound data cannot be used. As a result, since the sound data that can be used in the electronic musical instrument 50 are limited, there is an increasing demand to use the subscription-type sound data also in the electronic musical instrument 50.

SUMMARY

An electronic device according to an embodiment of the disclosure is an electronic device connected to a server which stores, for each user, management information related to allowability of use of data of a subscription type permitted to be used within a predetermined period, and the electronic device includes a data storage means, a confirmation means, and a permission means. The data storage means stores the data. The confirmation means confirms, with the server, management information of a user of the electronic device. The permission means permits using, in the electronic device, data deemed usable in the management information confirmed by the confirmation means, among data of the subscription type stored in the data storage means.

A data usage method according to an embodiment of the disclosure is a data usage method executed in an electronic device connected to a server which stores, for each user, management information related to allowability of use of data of a subscription type permitted to be used within a predetermined period, and the data usage method includes the following steps. Management information of a user of the electronic device is confirmed with the server. It is permitted to use, in the electronic device, data deemed usable in the confirmed management information, among data of the subscription type stored in the electronic device.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1**A illustrates an outline of a communication system. FIG. **1**B illustrates an appearance of a communication device.

FIG. **2** illustrates communication performed by a communication device, an electronic musical instrument, a mobile terminal, and a server in a setup mode.

FIG. **3** illustrates communication performed by the communication device, the electronic musical instrument, the mobile terminal, and the server after the setup mode.

FIG. **4** is a view illustrating an outline of loading, writing, and installation.

FIG. **5** is a view showing the communication performed by the communication device, the electronic musical instrument, the mobile terminal, and the server in loading.

FIG. **6** is a view showing the communication performed by the communication device, the electronic musical instrument, the mobile terminal, and the server in writing.

FIG. **7** is a view showing the communication performed by the communication device, the electronic musical instrument, the mobile terminal, and the server in installation.

FIG. **8** is a functional block diagram of the electronic musical instrument.

FIG. **9** is a block diagram showing electrical configurations of the communication device and the electronic musical instrument in the communication system.

FIG. **10**A is a view schematically showing a flash ROM. FIG. **10**B is a view schematically showing a content state table.

FIG. **11** is a block diagram showing electrical configurations of the mobile terminal and the server in the communication system.

FIG. **12**A schematically illustrates a user database (DB). FIG. **12**B schematically illustrates a device DB. FIG. **12**C is schematically illustrates sync data. FIG. **12**D schematically illustrates a load history.

FIG. **13** is a view schematically showing management information.

FIG. **14**A is a flowchart of a communication device main processing. FIG. **14**B is a flowchart of a mobile terminal main processing. FIG. **14**C is a flowchart of a server main processing.

FIG. **15** is a flowchart of a BT communication part setup processing.

FIG. **16** is a flowchart of a Wi-Fi main processing.

FIG. **17** is a flowchart of a Wi-Fi communication part setup processing.

FIG. **18** is a flowchart of a mobile terminal setup processing.

FIG. **19** is a flowchart of a server setup processing.

FIG. **20** is a flowchart of a Wi-Fi communication part workflow processing.

FIG. **21**A is a flowchart of an electronic musical instrument main processing. FIG. **21**B is a flowchart of an electronic musical instrument workflow processing.

FIG. **22** is a flowchart of a mobile terminal workflow processing.

FIG. **23** is a flowchart of an HTTPS workflow processing.

FIG. **24** is a flowchart of an MQTT workflow processing.

FIG. **25** is a flowchart of a mobile terminal event processing.

FIG. **26**A is a flowchart of a mobile terminal loading processing. FIG. **26**B is a flowchart of a mobile terminal writing processing. FIG. **26**C is a flowchart of a mobile terminal installation processing.

FIG. **27** is a flowchart of a server MQTT event processing.

FIG. **28** is a flowchart of a server HTTPS event processing.

FIG. **29** is a flowchart of a server sync processing.

FIG. **30** is a flowchart of an electronic musical instrument event processing.

FIG. **31** is a flowchart of an electronic musical instrument writing processing.

FIG. **32** is a flowchart of an electronic musical instrument installation processing.

FIG. **33** is a flowchart of an electronic musical instrument upon-startup processing.

FIG. **34** is a flowchart of an upon-startup confirmation processing.

FIG. **35** is a flowchart of an upon-connection confirmation processing.

DESCRIPTION OF THE EMBODIMENTS

Embodiments of the disclosure provide an electronic device and a data usage method capable of using subscription-type data.

Hereinafter, exemplary embodiments will be described with reference to the accompanying drawings. An outline of a communication system S of the present embodiment will be described with reference to FIG. **1**A and FIG. **1**B. FIG. **1**A illustrates the outline of the communication system S, and FIG. **1**B illustrates an appearance of a communication device **1**. As shown in FIG. **1**A, the communication system S includes an electronic musical instrument **30**, a mobile terminal **50**, and a server **70**. The electronic musical instrument **30** is connected to an access point (AP) **90** by wireless communication by Wi-Fi®, and is connected to the Internet N from the AP **90**. The mobile terminal **50** is connected to a base station **100**, and is connected to the Internet N from the base station **100**. Since the server **70** is also connected to the Internet N, the electronic musical instrument **30** and the server **70** as well as the mobile terminal **50** and the server **70** are configured to be mutually communicable via the Internet N. Accordingly, information can be exchanged between the electronic musical instrument **30** and the mobile terminal **50** via the server **70**.

The electronic musical instrument **30** is a device (electronic device) that produces a musical tone based on a performance of a user H. The electronic musical instrument **30** is provided with timbre data having information about timbre and wave data, and a timbre according to selection of the user H is acquired from the timbre data and the wave data and outputted as a musical tone. The timbre data and the wave data may be built in the electronic musical instrument **30** at the time of factory shipment, and may also be acquired from the server **70** via the Internet N. Next, communication by the electronic musical instrument **30** like this with an external device such as the server **70** will be described.

The communication device **1** is connected to the electronic musical instrument **30**. The communication device **1** is a device that communicates with the external device by Wi-Fi or Bluetooth®, and is detachably connected to the electronic musical instrument **30** via USB®. The data inputted from the electronic musical instrument **30** to the communication device **1** via USB is transmitted to the external device via Wi-Fi or Bluetooth. On the other hand, the data received by the communication device **1** from the external device via Wi-Fi or Bluetooth is inputted to the electronic musical instrument **30** via USB. As shown in FIG. **1**B, the communication device **1** is provided with an operation button **2** for inputting an instruction from the user H, and an LED **3**. An operation state of the communication device **1** is notified to the user H by a lighting state or blinking state of the LED **3**.

The communication device **1** is connected to the AP **90** by Wi-Fi communication, and is connected to the Internet N via the AP **90**. Since the server **70** is connected to the Internet N, the electronic musical instrument **30** is able to communicate with the server **70** via the communication device **1**.

The mobile terminal **50** is an information processing device (computer) that performs a processing according to the instruction inputted from the user H. The mobile terminal **50** is configured to be able to acquire the timbre data from the server **70** to the electronic musical instrument **30** in response to the instruction from the user H, and details thereof will be described later. In the mobile terminal **50**, the timbre data stored on the server **70** can also be acquired via the Internet N and utilized.

The server **70** is an information processing device that stores timbre data, wave data, etc. to be used in the electronic musical instrument **30** and the mobile terminal **50**. The timbre data are data composed of a plurality of variable values (attack, decay, cutoff, etc.) related to the timbre. The wave data are digitally converted from basic waveforms such as sine waves, square waves, triangular waves, saw-toothed waves, and sound waveforms of acoustic instruments collected by a microphone. Based on the wave data selected by the user H as an original sound, the electronic musical instrument **30** processes the sound according to each variable value set in the timbre data similarly selected by the user H and produces a sound of the processed timbre.

In addition to the timbre data and the wave data, the server **70** also stores musical score data or the like to be utilized by the electronic musical instrument **30** or the mobile terminal **50**. Hereinafter, data such as the timbre data stored on the server **70** that can be utilized by the electronic musical instrument **30** or the mobile terminal **50** will be referred to as "resources".

When connecting the communication device **1** to the AP **90**, it is necessary to set information about the AP **90** to be connected and a password for connecting to the AP **90** in the communication device **1**. Since the communication device **1** and the electronic musical instrument **30** to which the communication device **1** is connected are only provided with a display device having the minimum necessary display capability or input capability, it is difficult for the user H to input the information about the AP **90** and the password of the AP **90** by the communication device **1** and the electronic musical instrument **30**.

In the present embodiment, in the mobile terminal **50**, a list of APs **90** searched by the communication device **1** is displayed, and the user H selects one AP **90** from the displayed list and inputs the password for connecting to the AP **90**. The information about the selected AP **90** and the inputted password are transmitted to the communication device **1**, and the communication device **1** performs connection to the AP **90** by using the received information about the AP **90** and the received password of the AP **90**. Accordingly, since there is no need for the user H to input the information about the AP **90** or the password of the AP **90** by the communication device **1** and the electronic musical instrument **30**, time and effort in connecting the communication device **1** and the electronic musical instrument **30** to the AP **90** can be reduced.

Next, communication performed by the communication device **1**, the electronic musical instrument **30**, the mobile terminal **50**, and the server **70** will be described with reference to FIG. **2** and FIG. **3**. FIG. **2** illustrates the communication performed by the communication device **1**, the electronic musical instrument **30**, the mobile terminal **50**, and the server **70** in a setup mode. In the communication system S, in the case where an instruction for a setup mode is given from the user H to the communication device **1** via the operation button **2**, connection to each of the commu-

nication device **1**, the electronic musical instrument **30**, the mobile terminal **50**, and the server **70** is performed.

Among them, the communication device **1** is provided with a Wi-Fi communication part **4** that performs communication by Wi-Fi and a BT communication part **5** that performs communication by Bluetooth. The mobile terminal **50** is provided with a BT communication part **60** that performs communication by Bluetooth and a base communication part **61** that communicates with a mobile phone base station **100** (hereinafter abbreviated as "base station **100**").

The setup mode is a mode for the communication device **1** to acquire from the mobile terminal **50** the information about the AP **90** (one selected as a connection destination by the user H) to be connected by Wi-Fi in order to connect the communication device **1** to the AP **90**. In the setup mode, reception of the information about the AP **90** from the mobile terminal **50** to the communication device **1** is performed by Bluetooth via the BT communication part **5**. In the setup mode, the communication of the information about the AP **90** is not necessarily performed by Bluetooth but may also be performed by other short-range wireless communication standards such as ZigBee®.

First, in the case where the communication device **1** is inserted into the electronic musical instrument **30** and the operation button **2** of the communication device **1** is pressed and held (e.g., the operation button **2** is continuously pressed for 5 seconds), the communication device **1** shifts to the setup mode (T**1**). The user H may be notified that the communication device **1** is in the setup mode by blinking the LED **3** at intervals of a predetermined time (e.g., 0.5 seconds) during execution of the setup mode.

The instruction for the setup mode is not limited to the case where the operation button **2** is pressed and held, but it is also possible to shift to the setup mode in the case where the operation button **2** is pressed a predetermined number of times (e.g., three times) in succession. The shift to the setup mode is not necessarily performed by operating the operation button **2** of the communication device **1**. For example, it is also possible to shift to the setup mode in response to an instruction from the electronic musical instrument **30** connected to the communication device **1**.

In order to pair the communication device **1** that has shifted to the setup mode by the processing of T**1** with the mobile terminal **50** by Bluetooth, the BT communication part **5** is set to a standby state, that is, a slave (child) state (T**2**). On the other hand, in the mobile terminal **50**, in the case where the instruction for the setup mode is inputted to the mobile terminal **50**, the BT communication part **60** is set to a transmission state, that is, a master (parent) state (T**3**). The mobile terminal **50** that has discovered the communication device **1** in the standby state by the processing of T**3** establishes pairing with the communication device **1** (A**1**).

In the pairing between the communication device **1** and the mobile terminal **50** in the processings of T**2** and T**3**, the communication device **1** is set to the standby state and the mobile terminal **50** is set to the transmission state. However, the disclosure is not limited thereto. The mobile terminal **50** may also be set to the standby state and the communication device **1** may also be set to the transmission state.

Herein, the mobile terminal **50** registers the user H with the server **70** via the base communication part **61** before the processings of T**3** and A**1** (A**2**). In response to such user registration, the server **70** creates a user identifier being an identifier unique to each user and registers the user identifier in a user DB **72***b* (see FIG. **12**A) of the server **70** (T**4**). After the processing of T**4**, the mobile terminal **50** logs in to the server **70** by the user H (A**3**). At the time of login, hypertext transfer protocol secure (HTTPS) access authorization information is transmitted from the server **70** to the mobile terminal **50**, and will be used for subsequent HTTPS protocol communication from the mobile terminal **50** to the server **70**.

After the pairing by the processing of A**1** is established, the mobile terminal **50** requests device registration data from the communication device **1** via the BT communication part **60** (A**4**). The device registration data is composed of a device identifier being an identifier uniquely set for each communication device **1** and product information indicating a product name or the like of the communication device **1**. The device identifier of the communication device **1** like this is registered with the server **70** to be described later. Since the device identifier is uniquely set for each communication device **1**, even if the user H owns multiple electronic musical instruments **30**, by sharing and using one registered communication device **1** in the multiple electronic musical instruments **30**, time and effort to register with the server **70** for each electronic musical instrument **30** can be saved.

The device identifier is not limited to an identifier unique to each communication device **1**, but may also be an identifier that identifies the electronic musical instrument **30** connected to the communication device **1**. In this case, the communication device **1** can uniquely identify the electronic musical instrument **30** by acquiring the identifier of the electronic musical instrument **30** from the electronic musical instrument **30** connected to the communication device **1**.

In response to the request for device registration data by the processing of A**4**, the communication device **1** transmits the device registration data including its own device identifier and product information to the mobile terminal **50** via the BT communication part **5** (A**5**). The mobile terminal **50** that has received the device registration data of the communication device **1** by the processing of A**5** transmits the device registration data to the server **70** via the base communication part **61** (A**6**, A**7**).

The server **70** registers the device registration data received by the processing of A**7** in a device DB **72***c* (see FIG. **12**B) together with the user identifier corresponding to the user H who has logged in by the above processing of A**3** (T**5**). Thus, the user identifier of the logged-in user H and the device registration data of the communication device **1** connected to the electronic musical instrument **30** used by the user H are stored in association in the device DB **72***c*.

After transmission of the device registration data of the communication device **1** by the above processing of A**5**, in order to acquire the list of APs **90** searched by the communication device **1**, the mobile terminal **50** requests the list of APs **90** from the communication device **1** via the BT communication part **60** (A**8**). The request for the list of APs **90** received by the BT communication part **5** of the communication device **1** by the processing of A**8** is transmitted to the Wi-Fi communication part **4** (A**9**). The Wi-Fi communication part **4** that has received the request for the list of APs **90** by the processing of A**9** searches for APs **90** capable of communication with the Wi-Fi communication part **4** and creates a list of APs **90** searched (T**6**).

The BT communication part **5** acquires the list of APs **90** created by the Wi-Fi communication part **4** by the processing of T**6** (A**10**), and the list of APs **90** is transmitted to the mobile terminal **50** via the BT communication part **5** (A**11**). The mobile terminal **50** that has received the list of APs **90** by the processing of A**11** displays the list of APs **90** and causes the user H to select one of the APs **90**. Then, the selected AP **90** and the password (input PSW) for connecting

to the AP **90** are acquired and transmitted to the communication device **1** via the BT communication part **60** (A**12**).

The communication device **1** that has received the selected AP **90** and the input PSW thereof by the processing of A**12** transmits these pieces of information to the Wi-Fi communication part **4** (A**13**) and stores these pieces of information (T**7**). After the processing of T**7**, the Wi-Fi communication part **4** connects to the AP **90** in the received information by using the received input PSW (T**8**).

From this point on, or in the case where the communication system S does not shift to the setup mode, the communication device **1** is connected to the AP **90** using the information stored by the processing of T**7**. Accordingly, the communication device **1** and the electronic musical instrument **30** are connected to the AP **90** via the Wi-Fi communication part **4**, and are able to communicate with the server **70** via the AP **90** and the Internet N.

In the BT communication part **5** of the communication device **1** and the BT communication part **60** of the mobile terminal **50**, in the case where the transmission by the processing of A**11** is completed, the Bluetooth communication is disconnected and the pairing is canceled (T**9**, T**10**). In the present embodiment, the device registration data is first registered with the server **70** by the processings of A**4** to A**7**, and after that, the information about the AP **90** or the like is transmitted from the mobile terminal **50** to the communication device **1** by the processings of A**8** to A**13**, T**6**, and T**7**. However, the disclosure is not limited thereto. The processings of A**8** to A**13**, T**6**, and T**7** may also be performed first, followed by the processings of A**4** to A**7**, or the processings of A**4** to A**7** may also be performed in parallel with the processings of A**8** to A**13**, T**6**, and T**7**.

As described above, in the setup mode, the information about the AP **90** connected by the Wi-Fi communication part **4** of the communication device **1** is transmitted from the mobile terminal **50** by Bluetooth communication. Accordingly, the AP **90** can be connected without inputting the information about the AP **90**, i.e., the target AP **90** and the input PSW thereof, by the communication device **1** and the electronic musical instrument **30** that are more restricted as input devices as compared with the mobile terminal **50**. Accordingly, the time and effort to be spent by the user H when connecting the communication device **1** and the electronic musical instrument **30** to the AP **90** can be reduced.

Herein, when the information about the AP is to be transmitted by Bluetooth communication, it is necessary to pair the BT communication part **5** of the communication device **1** with the BT communication part **60** of the mobile terminal **50**. However, in such pairing, there is no need for the user H to input authentication information or the like. Thus, the time and effort to be spent by the user H when connecting the communication device **1** and the electronic musical instrument **30** to the AP **90** can be reduced.

When the pairing between the BT communication part **5** of the communication device **1** and the BT communication part **60** of the mobile terminal **50** is established, the device registration data of the communication device **1** is transmitted to the server **70** via the mobile terminal **50**, and is registered in the device DB **72***c* together with the user identifier of the user H who has logged in to the server **70** from the mobile terminal **50**. Accordingly, the device registration data of the communication device **1** can be reliably registered with the server **70** in association with the user identifier of the user H.

Based on the device registration data and the user identifier registered with the server **70** in this way, after the setup mode, resources stored on the server **70** can be accessed from the electronic musical instrument **30**. Further, when the pairing between the BT communication part **5** of the communication device **1** and the BT communication part **60** of the mobile terminal **50** is established, since the device registration data of the communication device **1** is automatically transmitted to the server **70**, the time and effort to be spent by the user H when registering the device registration data with the server **70** can be reduced.

Next, communication performed by the communication device **1**, the electronic musical instrument **30**, the mobile terminal **50**, and the server **70** after the communication device **1** is connected to the AP **90** by the setup mode of FIG. **2** will be described. FIG. **3** illustrates the communication performed by the communication device **1**, the electronic musical instrument **30**, the mobile terminal **50**, and the server **70** after the setup mode.

In the communication system S, after the setup mode, a resource stored on the server **70** is received by the communication device **1**, and the received resource is utilized by the electronic musical instrument **30**. Specifically, first, the device identifier of the communication device **1** is transmitted from the communication device **1** to the server **70** via the Wi-Fi communication part **4** (A**20**). In the processing of A**20**, the transmission of the device identifier from the communication device **1** to the server **70** is performed by communication using a message queuing telemetry transport (MQTT) protocol. The communication of the communication device **1** with the server **70** in and after A**20** is performed via the Wi-Fi communication part **4**.

The server **70** that has received the device identifier by the processing of A**20** acquires the user identifier corresponding to the device identifier from the device DB **72***c* (see FIG. **12**B), and creates the HTTPS access authorization information based on the user identifier (T**20**). The HTTPS access authorization information is information for authorizing the user H to access a resource when the communication device **1** communicates with the server **70** by HTTPS.

The HTTPS access authorization information created by the processing of T**20** and the user identifier corresponding to the device identifier transmitted by the processing of A**20** are transmitted to the communication device **1** by communication using the MQTT protocol (A**21**). The user identifier received by the processing of A**21** will be used for subsequent communication between the communication device **1** and the server **70** using the MQTT protocol. The user identifier and the HTTPS access authorization information received together with the user identifier will be used for subsequent communication between the communication device **1** and the server **70** using an HTTPS protocol.

After the processing of A**21**, a request of the user H for accessing the resource is transmitted from the communication device **1** to the server **70** in response to an instruction from the electronic musical instrument **30** (A**22**). The transmission of the request in the processing of A**22** is performed by communication using the HTTPS protocol, and at that time, the request is transmitted including the user identifier and the HTTPS access authorization information received by the processing of A**21**.

In the case where the server **70**, upon receiving the request by the processing of A**22**, determines that the HTTPS access authorization information is valid for the requested resource, the server **70** transmits the resource to the communication device **1** that made the request by the processing of A**22** (A**23**). The transmission from the server **70** to the communication device **1** by the processing of A**23** is also performed by communication using the HTTPS protocol, like the processing of A**22**. The resource transmitted by the process-

ing of A**23** is transmitted from the communication device **1** to the electronic musical instrument **30**, and is utilized by the electronic musical instrument **30**. In the processing of A**22**, in order to confirm (verify) whether the requested resource belongs to the user H, the user identifier included in the received request may be confirmed, or both the HTTPS access authorization information and the user identifier may be confirmed.

As described above, after the setup mode, the communication device **1** transmits its own device identifier to the server **70**, and the user identifier corresponding to the device identifier and the HTTPS access authorization information created based on the user identifier are transmitted from the server **70** to the communication device **1**. The communication device **1** acquires the resource from the server **70** by using the received HTTPS access authorization information or the user identifier, and the resource acquired by the communication device **1** is utilized by the electronic musical instrument **30**. That is, when the resource on the server **70** is to be acquired in the electronic musical instrument **30**, the resource can be directly acquired from the server **70** without acquiring via another recording medium or the like. Accordingly, the resource on the server **70** can be easily acquired and utilized on the electronic musical instrument **30**.

Further, the communication device **1** receives the user identifier of the user H of the connected electronic musical instrument **30** and the HTTPS access authorization information created based on the user identifier, and acquires the resource of the user H from the server **70** by using these pieces of information. That is, since the resource of the user H corresponding to the communication device **1** is acquired by the electronic musical instrument **30** of the user H, it is possible to prevent the electronic musical instrument **30** of the user H from accessing a resource of another user H.

The transmission of the device identifier from the communication device **1** by the processings of A**20** and A**21** and the transmission of the user identifier and the HTTPS access authorization information are performed by communication using the MQTT protocol. Since communication using the MQTT protocol is more lightweight than communication using the HTTPS protocol, the transmission of the device identifier and the transmission of the user identifier and the HTTPS access authorization information by the processings of A**20** and A**21** can be quickly performed.

Further, the acquisition of the HTTPS access authorization information and the user identifier from the server **70** by the communication device **1** is performed immediately after each time the communication between the communication device **1** and the server **70** is established, whether the setup mode has been executed or not. Accordingly, since the HTTPS access authorization information in particular will be the latest when communication with the server **70** is established, it is possible to prevent using the same HTTPS access authorization information for a long period of time.

For example, by regularly updating the format of the HTTPS access authorization information transmitted by the server **70** to the communication device **1**, even if the HTTPS access authorization information or the request by the processing of A**22** based on the HTTPS access authorization information is leaked, after the HTTPS access authorization information is updated, no more resources can be acquired from the server **70** by the leaked HTTPS access authorization information. Thus, leakage of the resource on the server **70** can be more effectively prevented.

The communication of A**20** and A**21** is not limited to communication using the MQTT protocol, but may also be performed according to other communication methods such as communication using the HTTPS protocol. Also, the communication of A**22** and A**23** is not limited to communication using the HTTPS protocol, but may also be performed according to other communication methods such as communication using the MQTT protocol.

In addition to utilization of the resource on the server **70** by the electronic musical instrument **30** in response to an instruction of the user H given to the electronic musical instrument **30** in this way, the resource on the server **70** can also be utilized by the electronic musical instrument **30** in response to an instruction of the user H given to the mobile terminal **50**. Such utilization of the resource on the server **70** by the electronic musical instrument **30** in response to the instruction to the mobile terminal **50** will be described.

After the setup mode described with reference to FIG. **2**, the mobile terminal **50** logs in to the server **70** via the base communication part **61** (A**24**). At the time of login, the HTTPS access authorization information is transmitted from the server **70** to the mobile terminal **50**, and will be used for subsequent HTTPS protocol communication from the mobile terminal **50** to the server **70**. The login by the processing of A**24** may be omitted in the case where the login by the processing of A**3** of FIG. **2** described above continues (that is, in the case where no logout has occurred). Subsequent communication of the mobile terminal **50** with the server **70** will be performed via the base communication part **61**.

After the processing of A**24**, the user identifier of the logged-in user H is requested (A**25**), the server **70** searches the user DB **72***b* for the requested user identifier (T**21**), and the searched user identifier is transmitted to the mobile terminal **50** that made the request for the user identifier (A**26**). The mobile terminal **50** requests from the server **70** the device registration data corresponding to the user identifier received by the processing of A**26** (A**27**).

The server **70** searches the device DB **72***c* for the device registration data corresponding to the user identifier requested by the processing of A**27** (T**22**), and transmits the corresponding device registration data to the mobile terminal **50** that made the request (A**28**).

The mobile terminal **50** registers the device registration data received by the processing of A**28** in an owned device list (T**24**). In the case where multiple pieces of device registration data are registered in the owned device list by the processing of T**24**, such as where the user H has multiple electronic musical instruments **30**, the user H is caused to select the device registration data corresponding to the communication device **1** of the electronic musical instrument **30** that will utilize the resource on the server **70** according to the instruction to the mobile terminal **50**.

After the processing of T**24**, the mobile terminal **50** operates as a user interface (UI) of the electronic musical instrument **30** to which the communication device **1** corresponding to the selected device registration data is connected (T**25**). A request based on an instruction for the electronic musical instrument **30** or the server **70** and accompanying information, and the user identifier received by the processing of A**26** and the device identifier of the selected device registration data is transmitted from the mobile terminal **50** to the server **70** (A**29**).

The server **70** transmits the request by the processing of A**29** to the communication device **1**, the communication device **1** transmits the request received from the server **70** to the electronic musical instrument **30**, and a processing corresponding to the request is executed in the electronic musical instrument **30** (A**30**). In the processing of A**30**, the server **70** may perform a necessary processing in response to

the request transmitted from the mobile terminal **50**, and transmit a result thereof to the communication device **1**.

As a specific example of the processings of A**29** and A**30**, a request (including a target parameter name and a set value after change) for instructing that a change be made to the parameter of the electronic musical instrument **30** is transmitted from the mobile terminal **50** to the server **70** (A**29**). The server **70** transmits the received request to the communication device **1**. The communication device **1** transmits the request transmitted from the server **70** to the electronic musical instrument **30**. The electronic musical instrument **30** performs a processing (parameter setting) according to the received request (A**30**). Other requests transmitted by the processing of A**29** include transmission of a parameter value of the electronic musical instrument **30** to the mobile terminal **50**.

As another specific example of the processings of A**29** and A**30**, the server **70** may perform a necessary processing in response to the request transmitted from the mobile terminal **50**, and transmit a result thereof to the communication device **1**. In this case, a request (including information for specifying a resource) for instructing that a list of predetermined resources stored on the server **70** be displayed is transmitted from the mobile terminal **50** to the server (A**29**). In response to the request, the server **70** creates a list of applicable resources and transmits a request (including the created list) instructing that the list be displayed to the communication device **1**. The communication device **1** transmits the received request to the electronic musical instrument **30**, and the electronic musical instrument **30** displays the list on an LCD **36** (see FIG. **9**) to be described later (A**30**).

As yet another specific example of the processings of A**29** and A**30**, the electronic musical instrument **30** may transmit a request to the server **70** in response to the request transmitted from the communication device **1**, and acquire a result of processing of the request in the server **70**. In this case, a request (including information for specifying a resource) for instructing that a resource utilized by the electronic musical instrument **30** be acquired from the server **70** is transmitted from the mobile terminal **50** to the server **70** (A**29**).

The server **70** transmits the received request to the communication device **1**, and the communication device **1** transmits the transmitted instruction to the electronic musical instrument **30**. Based on the received instruction, the electronic musical instrument **30** transmits a request to the communication device **1** instructing that the specified resource be transmitted to the electronic musical instrument **30**. The communication device **1** transmits the request to the server **70**. The server **70** transmits the resource specified by the received request to the communication device **1**. The communication device **1** transmits the received resource to the electronic musical instrument **30**. The electronic musical instrument **30** utilizes the resource transmitted from the communication device **1** (A**30**).

As described above, the instruction (request) from the mobile terminal **50** is transmitted from the server **70** to the communication device **1** and the electronic musical instrument **30**. The mobile terminal **50** is equipped with a display device having more abundant functions than the communication device **1** and the electronic musical instrument **30**. In this manner, for example, by transmitting information instructing the resource to be used by the electronic musical instrument **30** from the mobile terminal **50**, usability for the user H concerning resource utilization by the electronic musical instrument **30** can be improved.

In the processings of A**24** to A**28**, after the mobile terminal **50** logs in to the server **70**, the user identifier is requested from the server **70**, the requested user identifier is transmitted to the mobile terminal **50**, and the mobile terminal **50** transmits the transmitted user identifier to the server **70**, thereby acquiring the corresponding device registration data from the server **70**. However, the disclosure is not limited thereto. When the mobile terminal **50** has logged in to the server **70**, the user DB **72***b* may be searched for the user identifier of the logged-in user H, the device DB **72***c* may be searched for the device registration data corresponding to the searched user identifier, and the searched device registration data may be transmitted to the mobile terminal **50** together with the user identifier. In this case, the processings of A**25** and A**27** performed by the mobile terminal **50** and the processing of A**26** performed by the server **70** may be omitted.

Herein, specific examples of the processings of T**25**, A**29**, and A**30** will be described with reference to FIG. **4** to FIG. **7**. FIG. **4** is a view illustrating an outline of loading, writing, and installation. In the present embodiment, loading, writing, and installation are provided as instructions from the mobile terminal **50** to the electronic musical instrument **30** for using the resources of the server **70**.

Loading is an instruction for acquiring a timbre data which is a type of the resources stored in the server **70** and setting as the timbre data to be actually (currently) used for sound production by the electronic musical instrument **30**. Writing is an instruction for acquiring a timbre data stored in the server **70** and storing to the electronic musical instrument **30** so that it can be used for sound production in the electronic musical instrument **30**. Installation is an instruction for acquiring a wave data which is a type of the resources stored in the server **70** and storing to the electronic musical instrument **30** so that it can be used for sound production in the electronic musical instrument **30**.

First, a configuration of the communication system S related to loading, writing, and installation will be described. The electronic musical instrument **30** is provided with a work memory **33***a*, a timbre memory **32***b*, and a wave memory **32***c*. The work memory **33***a* stores the timbre data used in a current performance of the user H and the attribute information of the timbre data. The work memory **33***a* may store a plurality of timbre data and their attribute information, and among them, the timbre data with which the performance of the user H is directly reflected is referred to as "current". The user H may select "current" by operating the electronic musical instrument **30**. The timbre memory **32***b* stores a plurality of timbre data and their attribute information as candidates to be stored in the work memory **33***a* and used for sound production, and the wave memory **32***c* stores a plurality of wave data and their attribute information.

Herein, the attribute information stored together with the timbre data in the work memory **33***a* or the like is configured with information associated with the timbre data and the wave data, such as the creator of the timbre data and the wave data, the date/time of creation of the timbre data and the wave data, etc.

The server **70** is provided with a timbre DB **72***d*, management information **72***g*, and the device DB **72***c* described above. The timbre DB **72***d* stores a plurality of timbre data (timbre 1, timbre 2, . . .) and a plurality of wave data (wave 1, wave 2, . . .). The management information **72***g* stores information related to the use of the data on the server **70** for each user H, such as information about the timbre data or the wave data purchased by the user H, the subscription author-

ity owned by the user H, etc. Hereinafter, the timbre data and the wave data will be collectively referred to as "sound data".

The subscription authority indicates the contract type for the user H to use the sound data on the server **70**, and is set to multiple levels of authority (specifically, "normal", "core", "professional", and "ultimate"). By purchasing the subscription authority of a desired level, the user H can acquire the sound data that is permitted to be used at this level from the server **70** and use the sound data within a predetermined period (e.g., one year) after purchase. Hereinafter, sound data that can be used within a predetermined period according to the purchased subscription authority will be referred to as "subscription-type sound data".

In addition to such subscription-type sound data, the server **70** is provided with "permanent-type sound data" which are sound data that are permanently usable upon purchase by the user H. Further, the server **70** also stores sound data combining the subscription type and the permanent type. In the case where the user H purchases the subscription authority to which the sound data belongs, the sound data can be used as a subscription-type sound data within a predetermined period, and in the case where the user H purchases the sound data, the sound data can be used as a permanent-type sound data regardless of the period.

The management information **72***g* stores, for each user H, the subscription authority owned by the user H and information about the permanent-type sound data purchased by the user H.

Next, an outline of a processing of the communication system S in loading will be described. In the case where an instruction for loading to the electronic musical instrument **30** is sent from the mobile terminal **50** to the server **70**, the timbre DB **72***d* is searched for the timbre data instructed for loading. In the case where the timbre data is present in the timbre DB **72***d*, by referring to the management information **72***g*, it is confirmed whether the timbre data can be used by the user H of the mobile terminal **50**, that is, whether the timbre data has been purchased by the user H or whether the timbre data can be used with the subscription authority of the user H.

Then, in the case where it is determined that the timbre data can be used by the user H, the server **70** transmits the timbre data and an instruction for loading the timbre data to the electronic musical instrument **30**. Based on the received instruction, the electronic musical instrument **30** stores the timbre data received together with the instruction to the work memory **33***a*. At the time of this storage, the user H may set whether to automatically select the received timbre data as "current". Therefore, according to the instruction from the mobile terminal **50**, the timbre data that can be used by the user H and stored in the server **70** can be used in the current performance of the electronic musical instrument **30**.

In addition to storing the timbre data stored in the server **70** to the work memory **33***a* of the electronic musical instrument **30**, as shown in FIG. **4**, loading also includes storing the timbre data stored in the timbre memory **32***b* to the work memory **33***a*. Also in this case, it is confirmed whether the target timbre data can be used based on the management information **72***g* of the server **70**, and the details thereof will be described later. The loading instruction for the electronic musical instrument **30** is not necessarily sent from the mobile terminal **50** via the server **70**, but the user H may also directly input the loading instruction to the electronic musical instrument **30**.

Next, an outline of a processing of the communication system S in writing will be described. In the case where an instruction for writing to the electronic musical instrument **30** is sent from the mobile terminal **50** to the server **70**, the timbre DB **72***d* is searched for the instructed timbre data in the same manner as in loading. In the case where the timbre data is present in the timbre DB **72***d*, by referring to the management information **72***g*, it is confirmed whether the timbre data can be used by the user H of the mobile terminal **50**, that is, whether the timbre data has been purchased by the user H or whether the timbre data can be used with the subscription authority of the user H.

Then, in the case where it is determined that the timbre data can be used by the user H, the server **70** transmits the timbre data and an instruction for writing the timbre data to the electronic musical instrument **30**. Based on the received instruction, the electronic musical instrument **30** stores the timbre data received together with the instruction to a predetermined area of the timbre memory **32***b*. Therefore, according to the instruction from the mobile terminal **50**, the timbre data that can be used by the user H and stored in the server **70** can be stored to the timbre memory **32***b* of the electronic musical instrument **30**, and can be used in the performance of the electronic musical instrument **30** by a subsequent instruction of the user H for the electronic musical instrument **30** or the mobile terminal **50**.

In addition to storing the timbre data stored in the server **70** to the timbre memory **32***b* of the electronic musical instrument **30**, as shown in FIG. **4**, writing also includes storing the timbre data stored in the work memory **33***a* to the timbre memory **32***b* in response to an instruction for writing from the mobile terminal **50** described above. Also in this case, it is confirmed whether the target timbre data can be used based on the management information **72***g* of the server **70**, and the details thereof will be described later. The instruction for writing to the electronic musical instrument **30** is not necessarily sent from the mobile terminal **50** via the server **70**, but the user H may also directly input the instruction for writing to the electronic musical instrument **30**.

Next, an outline of a processing of the communication system S in installation will be described. In the case where an instruction for installation to the electronic musical instrument **30** is sent from the mobile terminal **50** to the server **70**, the timbre DB **72***d* is searched for the instructed wave data. In the case where the wave data is present in the timbre DB **72***d*, by referring to the management information **72***g*, it is confirmed whether the wave data can be used by the user H of the mobile terminal **50**, that is, whether the wave data has been purchased by the user H or whether the wave data can be used with the subscription authority of the user H.

Then, in the case where it is determined that the wave data can be used by the user H, the server **70** transmits the wave data and an instruction for installing the wave data to the electronic musical instrument **30**. Based on the received instruction, the electronic musical instrument **30** stores the wave data received together with the instruction to a predetermined area of the wave memory **32***c*. The wave data stored in the wave memory **32***c* will be appropriately used in performance according to an instruction of the user H for the electronic musical instrument **30**. Therefore, according to the instruction from the mobile terminal **50**, the wave data that can be used by the user H and is stored in the server **70** is stored to the wave memory **32***c* of the electronic musical instrument **30**, and will be used in subsequent performance of the electronic musical instrument **30**.

The wave data to be used in a performance of the electronic musical instrument **30** is not necessarily set

according to an instruction of the user H to the electronic musical instrument **30**, but may also be set according to an instruction to the electronic musical instrument **30** via the mobile terminal **50** and the server **70**.

In the case where loading, writing, or installation is performed in the electronic musical instrument **30** in this manner, the contents of the work memory **33***a*, the timbre memory **32***b*, and the wave memory **32***c* are changed, and a processing is performed for the server **70** and the mobile terminal **50** to learn about the changed contents.

Specifically, the server **70** is provided with a load history **72***f* and sync data **72***e*. The load history **72***f* stores a count of a timbre data being stored to the work memory **33***a* of the electronic musical instrument **30**. Specifically, an identifier for identifying a timbre data, and a load count, which is a count of the timbre data being stored to the work memory **33***a* and used for performance, are stored in association with each other for each user in the load history **72***f*.

In the case where loading has been performed in the electronic musical instrument **30**, the identifier of the loaded timbre data is transmitted to the server **70**. In the server **70**, **1** is added to the load count of the timbre data corresponding to the identifier in the load history **72***f* for the user H of the electronic musical instrument **30** from which the identifier of the timbre data has been transmitted to update the load count. Accordingly, in the case where loading has been performed in the electronic musical instrument **30**, the load count is also reflected in the server **70**.

By confirming the load count of such a load history **72***f*, in the server **70**, it is possible to learn about the preferred timbre data of the user H that were frequently loaded by the user H in the past. Further, by transmitting the load count of such a load history **72***f* to the mobile terminal **50**, and displaying the timbre data in a sequence of loading frequency, i.e., in a sequence of preference of the user H, on the mobile terminal **50**, the user H can preferentially load the preferred timbre data into the electronic musical instrument **30**.

On the other hand, by confirming the load count of the load history **72***f*, in the server **70**, it is also possible to learn about the timbre data rarely loaded by the user H in the past. Such rarely loaded timbre data may not be recognized by the user H as timbre data that are available. Therefore, by displaying the rarely loaded timbre data on the mobile terminal **50**, it is possible to allow the user H to recognize that the timbre data are available and prompt the user H to use the timbre data.

The update of the load history **72***f* of the server **70** is not limited to when loading has been performed in the electronic musical instrument **30**. For example, the load history **72***f* may also be updated at regular time intervals (e.g., every 10 minutes) or when the power of the electronic musical instrument **30** is turned on.

Herein, in the case where the load history **72***f* of the server **70** is updated only when loading has been performed in the electronic musical instrument **30**, the processing of the electronic musical instrument **30** for the update (e.g., a communication processing with the server **70**) may coincide with a processing related to the performance of the electronic musical instrument **30**, and the processing of the electronic musical instrument **30** may be delayed as a whole. As a result, the user H who is about to perform with the newly loaded timbre data has to wait.

In contrast, by setting the timing for updating the load history **72***f* at regular time intervals or to turn-on of the power of the electronic musical instrument **30**, it is possible to prevent the processing of the update from coinciding with the processing related to the performance of the electronic musical instrument **30**. Accordingly, the response of the electronic musical instrument **30** can be improved, so that the newly loaded timbre data can be quickly used for the performance of the user H, and further, the load count of the loaded timbre data can be appropriately reflected in the load history **72***f* of the server **70**.

The sync data **72***e* store information about the timbre data and the wave data stored in the timbre memory **32***b* and the wave memory **32***c* of the electronic musical instrument **30**. The sync data **72***e* store the identifiers and attribute information of the timbre data and the wave data for each electronic musical instrument **30** and each user H of the electronic musical instrument **30**.

In the case where writing or installation has been performed in the electronic musical instrument **30**, the identifier and attribute information of the target timbre data or the target wave data stored in the timbre memory **32***b* or the wave memory **32***c* are transmitted to the server **70**. In the server **70**, the transmitted identifier and attribute information of the timbre data or the wave data are stored to an area in the sync data **72***e* corresponding to the electronic musical instrument **30** from which the identifier of the timbre data or the wave data has been transmitted and the user H of the electronic musical instrument **30**. Accordingly, the information about the timbre data or the wave data written or installed in the electronic musical instrument **30** is also reflected in the server **70**.

With the sync data **72***e*, in the server **70**, it is possible to learn about the timbre data and the wave data stored in the timbre memory **32***b* and the wave memory **32***c* of the electronic musical instrument **30**. Further, such sync data **72***e* are transmitted to the mobile terminal **50**. Then, when the timbre data or the wave data that may be written or installed are displayed on the mobile terminal **50** in the case where writing or installation is to be performed, among these data, the timbre data or the wave data determined according to the sync data **72***e* to have been written or installed may be displayed in gray or attached with a strikethrough to change the display mode. Accordingly, the user H is allowed to recognize that the timbre data or the wave data have been written or installed, and it is possible to prevent the timbre data or the wave data from being repeatedly written or installed.

When writing or installation has been performed, the identifier and attribute information of the target timbre data or the like stored in the timbre memory **32***b* or the wave memory **32***c* are transmitted to the server **70**, but the disclosure is not limited thereto. For example, the identifier and attribute information of the timbre data and the wave data stored in the timbre memory **32***b* and the wave memory **32***c* may all be transmitted to the server **70** at regular time intervals (e.g., every 10 minutes) or at the time of turn-on of the power of the electronic musical instrument **30**. Accordingly, the identifier and attribute information of the timbre data and the wave data acquired by the electronic musical instrument **30** via a storage medium such as a USB memory can also be transmitted to the server **70** in the same manner as the timbre data and the wave data acquired from the server **70**.

Herein, in the case where the reflection to the sync data **72***e* of the server **70** is performed only when writing or installation has been performed in the electronic musical instrument **30**, the processing of the electronic musical instrument **30** for the reflection (e.g., a communication processing with the server **70**) may coincide with a processing related to the performance of the electronic musical

instrument **30**, and the processing of the electronic musical instrument **30** may be delayed as a whole. In contrast, by setting the timing of the reflection to the sync data **72***e* at regular time intervals or to the turn-on of the power of the electronic musical instrument **30**, it is possible to prevent the processing of the reflection from coinciding with the processing related to the performance of the electronic musical instrument **30**. Accordingly, the response of the electronic musical instrument **30** can be improved, and the identifier and attribute information of the written or installed loaded timbre data or wave data can be appropriately reflected in the sync data **72***e* of the server **70**.

Herein, also in the case of using sound data, such as loading or writing timbre data or switching wave data used for performance according to an instruction from the electronic musical instrument **30**, it is confirmed whether the target sound data can be used based on the management information **72***g* of the server **70**. Specifically, management information of the user H who is using the electronic musical instrument **30** is acquired from the management information **72***g* of the server **70** and is stored to management information **33***b* of the electronic musical instrument **30**.

Then, based on the management information stored in the management information **33***b*, it is confirmed whether the sound data stored in the timbre memory **32***b* or the wave memory **32***c* can be used or cannot be used. At this time, the state "usable" or "unusable" of each sound data is stored to a content state table **32***d*. Then, the sound data determined to be usable in the management information stored in the management information **33***b* is set to be "valid" so that it can be used for loading, writing, etc., and the sound data determined to be unusable is set to be "invalid" so that it cannot be used.

Accordingly, also in the case where the subscription-type sound data is used according to an instruction from the electronic musical instrument **30**, the sound data can be appropriately used based on the management information **72***g* of the server **70**. Therefore, a performance with rich expression by the electronic musical instrument **30** can be realized with such subscription-type sound data and permanent-type sound data.

In addition, the electronic musical instrument **30** may be used in an environment such as an outdoor stage where communication with the server **70** cannot be established. In such an environment, since the electronic musical instrument **30** cannot receive the management information from the management information **72***g* of the server **70**, the subscription-type sound data stored in the timbre memory **32***b* or the wave memory **32***c* cannot be used.

Therefore, in the present embodiment, the communication between the electronic musical instrument **30** and the server **70** continues to be unable to be established, and up to when the power of the electronic musical instrument **30** has been turned on 10 times during this period, the sound data stored in the timbre memory **32***b* or the wave memory **32***c* are set to be valid or invalid according to the state of "usable" or "unusable" of the sound data stored in the content state table **32***d* based on the management information **33***b* immediately before it becomes possible to establish the communication.

Accordingly, even if the electronic musical instrument **30** cannot communicate with the server **70**, the subscription-type sound data that have been usable by the user H can be used for a certain period of time immediately before it becomes possible to establish the communication. Therefore, regardless of the usage environment of the electronic musical instrument **30**, the subscription-type sound data usable by the user H can be maintained, and a richly expressive performance can be realized. Further, by setting the period of setting validity or invalidity of the sound data to 10 times of power-on of the electronic musical instrument **30**, it is possible to suppress such an exceptional state of validity or invalidity of the sound data from unreasonably continuing for a long period of time.

Further, in the present embodiment, based on the intention of the user H, it is possible to set validity or invalidity of the sound data stored in the timbre memory **32***b* or the wave memory **32***c* according to the state of "usable" or "unusable" of the sound data stored in the content state table **32***d*.

Specifically, the electronic musical instrument **30** is provided with a livelock flag **32***e*. The livelock flag **32***e* is a flag that can be switched on and off by a predetermined operation of the user H on a setting key **35** of the electronic musical instrument **30** to be described later. In the case where the livelock flag **32***e* is set to on by an operation of the user H on the setting key **35**, the sound data stored in the timbre memory **32***b* or the wave memory **32***c* is set to be valid or invalid according to the state of "usable" or "unusable" of the sound data stored in the content state table **32***d* immediately before the livelock flag **32***e* is turned on.

Accordingly, even in the case where the user H brings and uses the electronic musical instrument **30** in an environment where communication with the server **70** is not guaranteed or in the case where the user H wants to maintain the subscription-type sound data that can be used with the current subscription authority, since it is possible to maintain the use of the subscription-type sound data that have been usable immediately before the livelock flag **32***e* is turned on, the user H can use the sound data without concern.

Further, while the livelock flag **32***e* is on, a limitation (penalty) is imposed on the subscription-type sound data. Specifically, while the livelock flag **32***e* is on, storage of edited subscription-type timbre data to the timbre memory **32***b*, and addition to new subscription-type sound data to the timbre memory **32***b* and the wave memory **32***c* are prohibited. Specifically, a button (not shown) for instructing storage of subscription-type timbre data or a button (not shown) for adding new sound data displayed on the LCD **36** (see FIG. **9**) of the electronic musical instrument **30** are hidden.

That is, by turning on the livelock flag **32***e*, the subscription-type sound data can be used, but on the other hand, storage or addition of the sound data is prohibited, and a limitation is imposed on the music activity of the user H. Accordingly, the user H may be made to recognize that the livelock flag **32***e* is in the on state, and may be motivated to turn off the livelock flag **32***e*.

Next, communication performed by the communication device **1**, the electronic musical instrument **30**, the mobile terminal **50**, and the server **70** in loading, writing, and installation will be described with reference to FIG. **5** to FIG. **7**. First, the communication in loading will be described. FIG. **5** is a view showing the communication performed by the communication device **1**, the electronic musical instrument **30**, the mobile terminal **50**, and the server **70** in loading.

In the loading, first, at the mobile terminal **50**, the user H is caused to select the timbre data to be loaded into the electronic musical instrument **30** (T**30**). After the processing of T**30**, the mobile terminal **50** transmits the identifier of the timbre data selected by the processing of T**30** and an instruction for loading the timbre data to the server **70** by communication using the MQTT protocol (A**40**).

The server **70** that has received the MQTT data by the processing of A**40** acquires, from the timbre DB **72***d*, the timbre data corresponding to the identifier of the timbre data

included in the received MQTT data (T**31**). After the processing of T**31**, the server **70** transmits the instruction for loading the timbre data received by the processing of A**40** and the timbre data acquired by the processing of T**31** to the communication device **1** by communication using the MQTT protocol (A**42**).

The communication device **1** that has received the instruction for loading the timbre data and the timbre data by the processing of A**42** transmits the instruction and the timbre data to the electronic musical instrument **30**, and then, in the electronic musical instrument **30**, the received timbre data is stored to the work memory **33***a* (T**32**). Accordingly, the timbre data instructed from the mobile terminal **50** is loaded into the electronic musical instrument **30**.

In the following, the electronic musical instrument **30** is also communicated with the server **70** via the communication device **1**, but the reference to the communication device **1** will be omitted for the sake of brevity. Therefore, for example, "transmitting a data A from the electronic musical instrument **30** to the server **70**" means that the data A is transmitted from the electronic musical instrument **30** to the communication device **1**, and the data A is transmitted from the communication device **1** to the server **70**. Similarly, "transmitting a data B from the server **70** to the electronic musical instrument **30**" means that the data B is transmitted from the server **70** to the communication device **1**, and the data B is transmitted from the communication device **1** to the electronic musical instrument **30**.

After the processing of T**32**, the electronic musical instrument **30** transmits the identifier of the timbre data loaded by the processing of T**32** to the server **70** by communication using the MQTT protocol (A**43**). The server **70** that has received the identifier of the timbre data loaded by the processing of A**43** adds 1 to the load count corresponding to the identifier in the load history **72***f* for the user H of the electronic musical instrument **30** from which the identifier of the timbre data has been transmitted (T**33**).

As described above, in the loading of the communication system S, in the case where the identifier of the timbre data and the instruction for loading the timbre data have been transmitted from the mobile terminal **50** to the server **70** by the processing of A**40**, the server **70** acquires the timbre data corresponding to the identifier of the timbre data from the timbre DB **72***d*, and transmits the timbre data together with the received instruction to the electronic musical instrument **30**. In the electronic musical instrument **30**, in response to the instruction received from the server **70**, the received timbre data is stored to the work memory **33***a*. Accordingly, the data on the server **70** can be used in the electronic musical instrument **30** without connecting another storage medium to the electronic musical instrument **30**.

At this time, since the timbre data acquired in advance in the server **70** by the processing of T**31** is transmitted together with the instruction to the electronic musical instrument **30**, after receiving the instruction, the electronic musical instrument **30** does not need to request the timbre data from the server **70** again. Accordingly, the data on the server **70** can be quickly used by the electronic musical instrument **30**.

Further, the instruction for the electronic musical instrument **30** is transmitted from the mobile terminal **50**. Since the mobile terminal **50** is provided with more abundant input devices and display devices than the electronic musical instrument **30**, usability for using the timbre data on the server **70** in the electronic musical instrument **30** can be improved.

Further, the loading instruction from the mobile terminal **50** to the server **70** and the loading instruction from the server **70** to the electronic musical instrument **30** are sent by communication using the MQTT protocol. By performing communication using the MQTT protocol which is more lightweight than communication using the HTTPS protocol, these instructions can be communicated quickly. Accordingly, it is possible to reduce the time required from sending a loading instruction at the mobile terminal **50** until loading is actually completed at the electronic musical instrument **30**.

In the case where the identifier of the timbre data and the instruction for loading the timbre data have been transmitted to the server **70** by the processing of A**40**, the server **70** acquires the timbre data corresponding to the identifier of the timbre data from the timbre DB **72***d* (T**31**) and transmits the timbre data together with the received instruction to the electronic musical instrument **30** (A**42**), but the disclosure is not limited thereto. For example, the processing of T**31** of the server **70** may be omitted, the server **70** may directly transmit the identifier and the loading instruction of the processing of A**40** to the electronic musical instrument **30**, and the electronic musical instrument **30** may request the server **70** for the corresponding timbre data.

Further, the processing of T**31** may be omitted in the server **70**, and instead, a URL may be created as a data request destination for acquiring the timbre data corresponding to the identifier of the processing of A**40** from the timbre DB **72***d*, and the URL and the loading instruction may be transmitted to the electronic musical instrument **30**. The electronic musical instrument **30** may transmit a request for timbre data based on the received URL to the server **70** by communication using the HTTPS protocol, and the timbre data corresponding to the request may be transmitted from the server **70** to the electronic musical instrument **30** by communication using the HTTPS protocol. At this time, the request for timbre data transmitted from the electronic musical instrument **30** may be transmitted including the HTTPS access authorization information received by the processing of A**21** in FIG. **3**.

Next, communication in writing will be described. FIG. **6** is a view showing the communication performed by the communication device **1**, the electronic musical instrument **30**, the mobile terminal **50**, and the server **70** in writing. In the writing, first, at the mobile terminal **50**, the user H is caused to select the timbre data to be written to the electronic musical instrument **30** (T**40**). After the processing of T**40**, the mobile terminal **50** transmits the identifier of the timbre data selected by the processing of T**40** and an instruction for writing the timbre data to the server **70** by communication using the MQTT protocol (A**50**).

The server **70** that has received the MQTT data by the processing of A**50** creates a URL for acquiring the timbre data corresponding to the identifier of the timbre data included in the received MQTT data from the timbre DB **72***d* (T**41**). After the processing of T**41**, the server **70** transmits the instruction for writing the timbre data received by the processing of A**50** and the URL acquired by the processing of T**41** to the electronic musical instrument **30** by communication using the MQTT protocol (A**51**).

The electronic musical instrument **30** that has received the URL and the writing instruction by the processing of A**51** acquires the timbre data from the URL and writes the acquired timbre data (T**42**). Specifically, the electronic musical instrument **30** transmits a request for timbre data based on the received URL to the server **70** by communication using the HTTPS protocol (A**52**). At this time, the HTTPS

access authorization information received by the processing of A**21** in FIG. **3** is also transmitted.

The server **70** from which the timbre data has been requested by the processing of A**52** acquires the corresponding timbre data from the timbre DB **72***d*, and transmits the acquired timbre data to the electronic musical instrument **30** by communication using the HTTPS protocol. The electronic musical instrument **30** stores the transmitted timbre data to the timbre memory **32***b* (A**53**).

In this manner, the transmission of the timbre data from the server **70** to the electronic musical instrument **30** in the processing of A**53** is performed by communication using the HTTPS protocol. Since communication using the HTTPS protocol can transmit a larger amount of data than communication using the MQTT protocol, the timbre data of various capacities stored in the server **70** can be directly acquired by the electronic musical instrument **30** from the server **70** to be used. Therefore, the time and effort to be spent by the user H when writing the timbre data to the electronic musical instrument **30** can be reduced, and the electronic musical instrument **30** can perform with rich expression.

Further, in addition to transmitting the URL created by the server **70** by the processings of T**41** and A**51** to the electronic musical instrument **30**, a request for timbre data of the server **70** is also sent from the electronic musical instrument **30** by the processings of A**52** and A**53**. That is, in the transmission of resources such as timbre data from the server **70** to the electronic musical instrument **30**, the resources may be directly transmitted from the server **70** to the electronic musical instrument **30** (A**23**, A**42**), or the resources may be transmitted from the server **70** in response to a request from the electronic musical instrument **30** (A**52**, A**53**). By appropriately using these means, resources can be flexibly transmitted from the server **70** to the electronic musical instrument **30**.

Along with the processings of A**52** and A**53** described above, a progress rate (0 to 100%) of the writing of the timbre data is transmitted from the electronic musical instrument **30** to the server **70** by communication using the MQTT protocol (A**54**), and the progress rate is transmitted from the server **70** to the mobile terminal **50** (A**55**). After the processing of A**55**, the mobile terminal **50** displays the received progress rate on the LCD **56** (see FIG. **11**) (T**44**), so that the user H is notified of the estimated time required for the writing to be completed.

In the case where the writing by the processings of A**52** and A**53** is completed, the electronic musical instrument **30** transmits the identifier and attribute information of the written timbre data and a sync instruction to the server **70** by communication using the HTTPS protocol (A**56**). At this time, the HTTPS access authorization information received by the processing of A**21** in FIG. **3** is also transmitted.

The server **70** that has received the sync instruction by the processing of A**56** stores the identifier and the attribute information received together with the instruction to the sync data **72***e* (T**43**). After the processing of T**43**, a notification that the storage to the sync data **72***e* is completed is transmitted to the electronic musical instrument **30** and the mobile terminal **50** by communication using the MQTT protocol (A**57**, A**58**).

The mobile terminal **50** that has received the notification that the storage to the sync data **72***e* is completed by the processing of A**58** transmits a request to the server **70** for the sync data **72***e* by communication using the HTTPS protocol (A**59**). At this time, the HTTPS access authorization information received by the processing of A**3** in FIG. **2** is also transmitted.

The server **70** that has received the request for the sync data **72***e* by the processing of A**59** transmits the sync data **72***e* to the mobile terminal **50** by communication using the HTTPS protocol (A**60**). The mobile terminal **50** that has received the sync data **72***e* by the processing of A**60** performs display on the LCD **56** based on the sync data **72***e* (T**45**).

In the case where the identifier of the timbre data and the instruction for writing the timbre data have been transmitted to the server **70** by the processing of A**50**, the server **70** creates a URL for acquiring the timbre data corresponding to the identifier of the timbre data from the timbre DB **72***d* (T**41**), and transmits the URL together with the received instruction to the electronic musical instrument **30** (A**51**), but the disclosure is not limited thereto. For example, the server **70** may omit the processing of T**41**, acquire the timbre data corresponding to the identifier of the processing of A**50** from the timbre DB **72***d*, and transmit the timbre data together with the received instruction to the electronic musical instrument **30**. Further, the processing of T**41** may be omitted, and the server **70** may transmit the identifier and the writing instruction of the processing of A**50** directly to the electronic musical instrument **30**, and the electronic musical instrument **30** may request the server **70** for the corresponding timbre data.

Next, communication in installation will be described. FIG. **7** is a view showing the communication performed by the communication device **1**, the electronic musical instrument **30**, the mobile terminal **50**, and the server **70** in installation. In the installation, first, at the mobile terminal **50**, the user H is caused to select the wave data to be installed to the electronic musical instrument **30** (T**50**).

After the processing of T**50**, the mobile terminal **50** transmits to the server **70** a request for confirming whether the wave data selected by the processing of T**50** can be installed by communication using the MQTT protocol (A**70**), and the server **70** transmits the received request to the electronic musical instrument **30** by communication using the MQTT protocol (A**71**). At this time, a size of the wave data to be installed is also transmitted.

The electronic musical instrument **30** that has received the request for confirming whether installation is possible by the processing of A**71** confirms a free space of the wave memory **32***c*, and confirms whether the wave data of the transmitted size can be installed (T**51**). After the processing of T**51**, the result of the processing of T**51** is transmitted to the server **70** by communication using the MQTT protocol (A**72**), and the server **70** transmits the received result to the mobile terminal **50** by communication using the MQTT protocol (A**73**).

After the processing of A**73**, if the result received by the processing of A**73** is "installable", the mobile terminal **50** transmits a request for creating a URL of the wave data specified by the user H to the server **70** by communication using the HTTPS protocol (A**74**). At this time, the HTTPS access authorization information received by the processing of A**3** in FIG. **2** is also transmitted. The server **70** that has been requested to create a URL of the wave data by the processing of A**74** creates a URL for acquiring the corresponding wave data from the timbre DB **72***d*, and transmits the created URL to the mobile terminal **50** by communication using the HTTPS protocol (A**75**).

After the processing of A**75**, the mobile terminal **50** transmits the received URL and an installation instruction to the server **70** by communication using the MQTT protocol

(A76), and the server **70** transmits the received URL and the installation instruction to the electronic musical instrument **30** by communication using the MQTT protocol (A77).

The electronic musical instrument **30** that has received the URL and the installation instruction by the processing of A77 acquires the wave data from the URL and installs the acquired wave data (T52). Specifically, the electronic musical instrument **30** transmits a request for wave data based on the received URL to the server **70** by communication using the HTTPS protocol (A78). At this time, the HTTPS access authorization information received by the processing of A21 in FIG. **3** is also transmitted.

The server **70** that has been requested for the wave data by the processing of A78, acquires the corresponding wave data from the timbre DB **72***d*, and transmits the acquired wave data to the electronic musical instrument **30** by communication using the HTTPS protocol. The electronic musical instrument **30** stores the transmitted wave data to the wave memory **32***c* (A79).

Along with the processings of A78 and A79, a progress rate (0 to 100%) of the installation of the wave data is transmitted from the electronic musical instrument **30** to the server **70** by communication using the MQTT protocol (A80), and the progress rate is transmitted from the server **70** to the mobile terminal **50** (A81). After the processing of A81, the mobile terminal **50** displays the received progress rate on the LCD **56** (T53), so that the user H is notified of the estimated time required for the installation to be completed.

In the case where the installation by the processings of A78 and A79 is completed, the electronic musical instrument **30** transmits the identifier and attribute information of the installed wave data and a sync instruction to the server **70** by communication using the HTTPS protocol (A82). At this time, the HTTPS access authorization information received by the processing of A21 in FIG. **3** is also transmitted.

The server **70** that has received the sync instruction by the processing of A82 stores the identifier and the attribute information received together with the instruction to the sync data **72***e* (T54). After the processing of T54, a notification that the storage to the sync data **72***e* is completed is transmitted to the electronic musical instrument **30** and the mobile terminal **50** by communication using the MQTT protocol (A83, A84).

The mobile terminal **50** that has received the notification that the storage to the sync data **72***e* is completed by the processing of A84 transmits a request for the sync data **72***e* to the server **70** by communication using the HTTPS protocol (A85). The server **70** that has received the request for the sync data **72***e* by the processing of A85 transmits the sync data **72***e* to the mobile terminal **50** by communication using the HTTPS protocol (A86). At this time, the HTTPS access authorization information received by the processing of A3 in FIG. **2** is also transmitted. The mobile terminal **50** that has received the sync data **72***e* by the processing of A86 performs display on the LCD **56** based on the sync data **72***e* (T55).

Next, the functions of the electronic musical instrument **30** will be described with reference to FIG. **8**. FIG. **8** is a functional block diagram of the electronic musical instrument **30**. As shown in FIG. **8**, the electronic musical instrument **30** includes a data storage means **300**, a confirmation means **301**, and a permission means **302**.

The data storage means **300** is a means for storing sound data and is realized by a flash ROM **32** to be described later with reference to FIG. **9**. The confirmation means **301** is a means for confirming with the server **70** the management information of the user H of the electronic musical instrument **30**, and is realized by a CPU **31** to be described later with reference to FIG. **9**. The permission means **302** is a means for permitting using, in the electronic musical instrument **30**, sound data deemed usable in the management information confirmed by the confirmation means **301**, among the subscription-type sound data stored in the data storage means **300**, and the permission means **302** is realized by the CPU **31**.

The electronic musical instrument **30** confirms with the server **70** the management information of the user H of the electronic musical instrument **30** managed by the server **70**, and permits the use of the sound data deemed usable in the confirmed management information, among the subscription-type sound data stored in the electronic musical instrument **30**. Accordingly, the subscription-type sound data can also be used in the electronic musical instrument **30**.

Next, an electrical configuration of the communication system S will be described with reference to FIG. **9** to FIG. **13**. First, electrical configurations of the communication device **1** and the electronic musical instrument **30** will be described with reference to FIG. **9**. FIG. **9** is a block diagram showing electrical configurations of the communication device **1** and the electronic musical instrument **30** in the communication system S. The communication device **1** includes a CPU **10**, a flash ROM **11**, and a RAM **12** each of which is connected to an input/output (I/O) port **14** via a bus line **13**. The operation button **2**, the LED **3**, the Wi-Fi communication part **4**, and the BT communication part **5** described above and an external IF **15** are further connected to the I/O port **14**.

The CPU **10** is an arithmetic unit that controls each part connected by the bus line **13**. The flash ROM **11** is a rewritable non-volatile storage device storing programs executed by the CPU **10**, fixed value data, etc., and includes a control program **11***a*, a device identifier **11***b* in which the device identifier of the communication device **1** is stored, product information **11***c* in which product information of the communication device **1** is stored, AP information **11***d* in which the information about the selected AP **90** acquired from the mobile terminal **50** is stored, and an AP password **11***e* in which the input PSW of the selected AP **90** is stored. When the control program **11***a* is executed by the CPU **10**, a communication device main processing of FIG. **14**A is executed. The RAM **12** is a memory rewritably storing various work data, flags, etc. when the CPU **10** executes a program.

The external IF **15** is a device for connecting to an external device, and is connected to an external IF **37** of the electronic musical instrument **30** to be described later. In the present embodiment, the external IF **15** is composed of a device based on USB standards. However, the external IF **15** may also be a device based on a communication standard other than USB. Communication between the communication device **1** and the electronic musical instrument **30** is performed via the external IF **15** and the external IF **37**.

The Wi-Fi communication part **4** and the BT communication part **5** are connected to a duplexer **16**. The duplexer **16** is a device that integrates radio waves transmitted and received by the Wi-Fi communication part **4** with radio waves transmitted and received by the BT communication part **5**. An antenna **17** is connected to the duplexer **16**. The radio waves transmitted by the Wi-Fi communication part **4** and the radio waves transmitted by the BT communication part **5** are integrated and transmitted from the antenna **17**. The radio waves received by the antenna **17** are appropri-

ately distributed to the Wi-Fi communication part **4** and the BT communication part **5**. By connecting the Wi-Fi communication part **4** and the BT communication part **5** to the duplexer **16**, transmission and reception of the radio waves of these two communication parts can be realized by one antenna **17**. The duplexer **16** may be omitted, and an antenna may be provided in each of the Wi-Fi communication part **4** and the BT communication part **5**.

Next, an electrical configuration of the electronic musical instrument **30** will be described. The electronic musical instrument **30** includes a CPU **31**, a flash ROM **32**, a RAM **33**, a keyboard **34** acquiring performance information according to a performance of the user H, a setting key **35** for the user H to input various settings, the LCD **36** displaying a setting state of the electronic musical instrument **30** or the like, the external IF **37**, a sound source **38**, and a digital signal processor **39** (hereinafter referred to as "DSP **39**") each of which is connected via a bus line **40**.

The CPU **31** is an arithmetic unit that controls each part connected by the bus line **40**. The flash ROM **32** is a rewritable non-volatile storage device storing programs executed by the CPU **31**, fixed value data, etc. Herein, the flash ROM **32** will be described with reference to FIG. **10**A and FIG. **10**B.

FIG. **10**A is a view schematically showing the flash ROM **32**. As shown in FIG. **10**A, the flash ROM **32** includes a control program **32***a*, the above timbre memory **32***b*, the wave memory **32***c*, the content state table **32***d*, and a power-on counter **32***f*. When the control program **32***a* is executed by the CPU **31**, an electronic musical instrument main processing of FIG. **21**A is executed. The content state table **32***d* stores whether the sound data stored in the timbre memory **32***b* and the wave memory **32***c* can be used or cannot be used based on the management information of the management information **33***b*. Herein, the content state table **32***d* will be described with reference to FIG. **10**B.

FIG. **10**B is a view schematically showing the content state table **32***d*. As shown in FIG. **10**B, in the content state table **32***d*, the identifier of the sound data stored in the timbre memory **32***b* and the wave memory **32***c*, the license type, and "valid/invalid" are stored in association with each other. In the "license type", in the case where the target sound data is the subscription type, it is stored as "subscription"; and in the case where the target sound data is the permanent type, it is stored as "permanent". In "valid/invalid", in the case where the target sound data is usable, it is stored as "valid"; and in the case where the target sound data is unusable, it is stored as "invalid".

In the content state table **32***d*, in the case where a timbre data is added to the timbre memory **32***b* by writing, the identifier of the timbre data is added to the content state table **32***d*; and in the case where a timbre data is deleted from the timbre memory **32***b*, the identifier of the timbre data is deleted from the content state table **32***d*. Similarly, in the case where a wave data is added to the wave memory **32***c* by installation, the identifier of the wave data is added to the content state table **32***d*; and in the case where a wave data is deleted from the wave memory **32***c*, the identifier of the wave data is deleted from the content state table **32***d*.

Returning to FIG. **10**A, the power-on counter **32***f* stores a value related to power-on of the electronic musical instrument **30**. Specifically, in the case where "10" is set as the initial value of the power-on counter **32***f* and the communicate with the server **70** continues to be unable to be established, when the power of the electronic musical instrument **30** is turned on, **1** is subtracted from the power-on counter **32***f*. When the power-on counter **32***f* becomes 0, the subscription-type sound data becomes unusable.

Returning to FIG. **9**, the RAM **33** is a memory for rewritably storing various work data, flags, etc. when the program is executed by the CPU **31**, and includes the above work memory **33***a* and the management information **33***b*. The details of the management information **33***b* will be described later with reference to FIG. **13**.

The external IF **37** is a device for connecting to an external device, and is mainly connected to the external IF **15** of the communication device **1** described above. In the present embodiment, like the external IF **15**, the external IF **37** is configured by a device based on a USB standard. However, the external IF **37** may also be a device based on a communication standard other than USB as long as it is of the same communication standard as the external IF **15**.

The sound source **38** is a device that outputs waveform data based on the timbre data of the current of the work memory **33***a* and the wave data of the wave memory **32***c* according to the performance information inputted from the keyboard **34**. The DSP **39** is an arithmetic unit for arithmetically processing the waveform data inputted from the sound source **38**. The sound source **38** and a digital-to-analog converter (DAC) **41** are connected to the DSP **39**, an amplifier **42** is connected to the DAC **41**, and a speaker **43** is connected to the amplifier **42**.

Next, electrical configurations of the mobile terminal **50** and the server **70** in the communication system S will be described with reference to FIG. **11** to FIG. **13**. FIG. **11** is a block diagram showing the electrical configurations of the mobile terminal **50** and the server **70** in the communication system S.

The mobile terminal **50** includes a CPU **51**, a flash ROM **52**, and a RAM **53** each of which is connected to an I/O port **55** via a bus line **54**. The BT communication part **60** and the base communication part **61** described above, an LCD **56** displaying a setting state of the mobile terminal **50** or the like, and a touch panel **57** to which an instruction from the user H is inputted are further connected to the I/O port **55**.

The CPU **51** is an arithmetic unit that controls each part connected by the bus line **54**. The flash ROM **52** is a rewritable non-volatile storage device storing programs executed by the CPU **51**, fixed value data, etc., in which a mobile control program **52***a* is stored. When the mobile control program **52***a* is executed by the CPU **51**, a mobile terminal main processing of FIG. **14**B is executed. The RAM **53** is a memory for rewritably storing various work data, flags, etc. when the CPU **51** executes a program.

The server **70** includes the CPU **71**, the HDD **72**, and a RAM **73** each of which is connected to an I/O port **75** via a bus line **74**. A communication part **76** that communicates with the Internet N is further connected to the I/O port **75**.

The CPU **71** is an arithmetic unit that controls each part connected by the bus line **74**. The HDD **72** is a rewritable non-volatile storage device storing programs executed by the CPU **71**, fixed value data, etc., and includes a server control program **72***a*, the user DB **72***b*, the device DB **72***c*, the above timbre DB **72***d*, the sync data **72***e*, the load history **72***f*, and the management information **72***g*. When the server control program **72***a* is executed by the CPU **71**, a server main processing of FIG. **14**C is executed.

The user DB **72***b* stores login-related information and the user identifier of the user H who has been registered. The device DB **72***c* stores the device identifier and the product information of the communication device **1**, and the user identifier of the user H who utilizes the communication device **1** (electronic musical instrument **30**). The user DB

72*b*, the device DB 72*c*, the sync data 72*e*, the load history 72*f*, and the management information 72*g* will be described with reference to FIG. 12A to FIG. 13.

FIG. 12A schematically illustrates the user DB 72*b*. As shown in FIG. 12A, the user DB 72*b* stores an account (e-mail address) and a password being the login-related information of the user H who has been registered in association with the user identifier created when the user H is registered. The account stored in the user DB 72*b* is not limited to an e-mail address, but may also be a name of the user H or a uniquely set arbitrary character string.

FIG. 12B schematically illustrates the device DB 72*c*. As shown in FIG. 12B, the device DB 72*c* stores the device identifier and product information of the communication device 1 that has been registered, and the user identifier of the user H who utilizes the communication device 1 (electronic musical instrument 30) in association with each other. Among them, the device identifier is registered in the device DB 72*c* at the time of factory shipment of the communication device 1, and the product information and the user identifier are registered in the device DB 72*c* in the setup mode described above.

FIG. 12C is a view schematically showing the sync data 72*e*. As shown in FIG. 12C, the sync data 72*e* stores the identifier of the timbre data or the wave data in association with the attribute information for each user identifier and device identifier. Further, FIG. 12D is a view schematically showing the load history 72*f*. As shown in FIG. 12D, the load history 72*f* stores the identifier of the timbre data and the load count in association with each other for each user identifier.

FIG. 13 is a view schematically showing the management information 72*g*. The management information 72*g* stores management information related to sound data usable by each user H. The management information 72*g* includes personal management information 72*g*1 of each user H registered with the service for obtaining sound data from the server 70, and shared management information 72*g*2 common to all the users H.

The personal management information 72*g*1 stores a user identifier, a subscription authority owned by the user H, and a purchase history 72*g*11 indicating the purchase history of the permanent-type sound data of the user H. When the registration of the user H is canceled, the personal management information 72*g*1 of the user H is deleted from the management information 72*g*.

One of "normal", "core", "professional", and "ultimate" is set as the subscription authority. "Core", "professional", and "ultimate" indicate a contract state in which the user H pays a fixed monthly fee and purchases the right to use specific sound data for a certain period of time.

The shared management information 72*g*2 stores a product information table 72*g*21 in which product information of sound data is stored, and an authority table 72*g*22 in which identifiers of sound data usable with each subscription authority are stored.

The product information table 72*g*21 stores information related to sound data currently being distributed. Specifically, the product information table 72*g*21 stores an identifier, a name, and a license type of a sound data for each sound data. The license type is set to a subscription type ("subscription"), a permanent type ("permanent"), or a combined type ("subscription/permanent") combining the subscription type and the permanent type.

The personal management information 72*g*1 of the user H of the electronic musical instrument 30 among the personal management information 72*g*1 of the management information 72*g* of FIG. 13 and the shared management information 72*g*2 are acquired from the server 70 and stored as management information to the management information 33*b* of the electronic musical instrument 30 described with reference to FIG. 9.

Returning to FIG. 11, the RAM 73 is a memory for rewritably storing various work data, flags, etc. when a program is executed by the CPU 71.

The server 70 performs two types of communication, namely, the communication using the HTTPS protocol and the communication using the MQTT protocol, with the communication device 1 and the mobile terminal 50. Specifically, in the communication using the MQTT protocol, the communication with the communication device 1 and the mobile terminal 50 is performed by exchanging a "topic" being a character string including a user identifier and a device identifier of a target to and from which a data is to be transmitted and received. Examples of the "topic" include "topic/{user identifier}/{device identifier}/# (#: any command such as data request)".

A "subscribe" function is provided for the communication using the MQTT protocol. In the "subscribe" function, by registering (hereinafter referred to as "subscription registration") the user identifier and device identifier for each communication device 1 and mobile terminal 50 with the server 70 in advance, when a topic is transmitted to the server 70, the server 70 transmits the topic to the communication device 1 and the mobile terminal 50 that correspond to the user identifier and the device identifier of the topic among multiple communication devices 1 and mobile terminals 50.

Accordingly, in the subscription registration of each of the communication device 1 (electronic musical instrument 30) and the mobile terminal 50 used by the user H with respect to the server 70, by registering the device identifier of the communication device 1 and the user identifier of the user H, a result obtained by transmitting the topic from the communication device 1 to the server 70 is transmitted to the communication device 1 and also to the mobile terminal 50, and a result obtained by transmitting the topic from the mobile terminal 50 to the server 70 is transmitted to the mobile terminal 50 and also to the communication device 1. By doing so, the communication device 1 and the mobile terminal 50 become able to exchange necessary information via the server 70.

In the subscription registration of the communication device 1, a character string indicating "for the communication device 1" may be registered in addition to the user identifier and the device identifier. In the subscription registration of the mobile terminal 50, a character string indicating "for the mobile terminal 50" may be registered in addition to the user identifier and so on. If registration is performed without addition of these character strings, in the case where a certain topic is processed by the server 70, a processing result is transmitted as well, and the topic transmitted by each of the communication device 1 and the mobile terminal 50 is transmitted (returned) to both of them. Therefore, even if a processing result according to the topic only needs to be transmitted to one of the communication device 1 and the mobile terminal 50, the processing result will always be transmitted to the other of them as well. In order to avoid this, in the subscription registration of the communication device 1, the character string indicating "for the communication device 1" is registered in addition to the user identifier and so on. In the subscription registration of

the mobile terminal **50**, the character string indicating "for the mobile terminal **50**" is registered in addition to the user identifier and so on.

Then, the communication device **1** transmits a topic including the character string indicating "for the communication device **1**", and the mobile terminal **50** transmits a topic including the character string indicating "for the mobile terminal **50**". Further, the server **70** transmits a topic including the character string "for the communication device **1**" in a processing result with respect to the topic including the character string indicating "for the communication device **1**". On the other hand, the server **70** transmits a topic including the character string "for the mobile terminal **50**" in a processing result with respect to the topic including the character string indicating "for the mobile terminal **50**". By doing so, the communication device **1** and the mobile terminal **50** are able to receive only a topic directed to themselves and a processing result according to the topic.

On the contrary, when instructing transmission of a processing result according to a topic for the mobile terminal **50** from the communication device **1**, the communication device **1** may transmit a topic including a character string indicating "for the mobile terminal **50**". When instructing transmission of a processing result according to a topic for the communication device **1** from the mobile terminal **50**, the mobile terminal **50** may transmit a topic including a character string indicating "for the communication device **1**".

Next, processings executed by the CPU **10** of the communication device **1**, the CPU **51** of the mobile terminal **50**, the CPU **71** of the server **70**, and the CPU **31** of the electronic musical instrument **30** will be described with reference to FIG. **14**A to FIG. **35**. First, main processings of the communication device **1**, the mobile terminal **50**, and the server **70** will be described with reference to FIG. **14**A to FIG. **14**C. FIG. **14**A is a flowchart of a communication device main processing, FIG. **14**B is a flowchart of a mobile terminal main processing, and FIG. **14**C is a flowchart of a server main processing.

The communication device main processing is a processing executed in the case where power of the communication device **1** is turned on. As shown in FIG. **14**A, in the communication device main processing, first, it is confirmed whether an instruction for the setup mode has been given by a long pressing operation on the operation button **2** (S**1**). In the processing of S**1**, if there is an instruction for the setup mode (S**1**: Yes), a BT communication part setup processing (S**2**) is executed; if there is no instruction for the setup mode (S**1**: No), the BT communication part setup processing (S**2**) is skipped. A Wi-Fi main processing (S**3**) is executed in parallel with the processings of S**1** and S**2**. In the BT communication part setup processing, a processing concerning the BT communication part **5** in the setup mode is performed, and details thereof will be described later with reference to FIG. **15**.

In the Wi-Fi main processing, a processing (specifically, a Wi-Fi setup processing to be described later with reference to FIG. **17**) concerning the Wi-Fi communication part **4** in the setup mode and a processing (specifically, a Wi-Fi communication part workflow processing to be described later with reference to FIG. **20**) concerning the Wi-Fi communication part **4** after the setup mode are performed. Details thereof will be described later.

After the processings of S**1** to S**3**, other processings (S**4**) concerning the communication device **1** are executed, and after that, the processings of S**1** to S**3** onwards are repeated. The processings of S**1** and S**2** and the processing of S**3** are not necessarily executed in parallel. The processing of S**3** may be executed after the processings of S**1** and S**2**, or the processings of S**1** and S**2** may be executed after the processing of S**3**.

The mobile terminal main processing is a processing executed in the case where an application program for the communication system S is launched on the mobile terminal **50**. As shown in FIG. **14**B, in the mobile terminal main processing, first, it is confirmed whether there is an instruction for the setup mode via the touch panel **57** (S**10**). In the processing of S**10**, if there is an instruction for the setup mode (S**10**: Yes), a mobile terminal setup processing (S**11**) is executed; if there is no instruction for the setup mode (S**10**: No), a mobile terminal workflow processing (S**12**) is executed.

The mobile terminal setup processing of S**11** is a processing in the setup mode of the mobile terminal **50**, and details thereof will be described later with reference to FIG. **18**. The mobile terminal workflow processing of S**12** is a processing of the mobile terminal **50** after the setup mode, and details thereof will be described later with reference to FIG. **22**. After the processings of S**11** and S**12**, other processings (S**13**) concerning the mobile terminal **50** are executed, and after that, the processing of S**10** onwards is repeated.

The server main processing is a processing executed in the case where power of the server **70** is turned on. As shown in FIG. **14**C, in the server main processing, first, a server setup processing (S**20**), an HTTPS workflow processing (S**21**), and an MQTT workflow processing (S**22**) are executed in parallel.

The server setup processing of S**20** is a processing in the setup mode of the server **70**, and details thereof will be described later with reference to FIG. **19**. The HTTPS workflow processing of S**21** is a processing concerning HTTPS protocol communication of the server **70** after the setup mode, and details thereof will be described later with reference to FIG. **23**. The MQTT workflow processing of S**22** is a processing concerning MQTT protocol communication of the server **70** after the setup mode, and details thereof will be described later with reference to FIG. **24**. After the processings of S**20** to S**22**, other processings (S**23**) concerning the server **70** are executed, and after that, the processings of S**20** to S**22** onwards are repeated.

The three processings of S**20** to S**22** are not necessarily executed in parallel. For example, the processing of S**20**, the processing of S**21**, and the processing of S**22** may be executed one by one in this order. Two of the processings of S**20** to S**22** may be executed in parallel, followed by the remaining processing; for example, the processing of S**20** and the processing of S**21** are executed in parallel, followed by the processing of S**22**. Alternatively, one of the processings of S**20** to S**22** may be executed, followed by the remaining processings in parallel; for example, the processing of S**21** and the processing of S**22** are executed in parallel after the processing of S**20**.

First, a processing of the setup mode of the communication device **1** will be described. FIG. **15** is a flowchart of the BT communication part setup processing (S**2**). In the BT communication part setup processing, first, the BT communication part **5** is set to a standby state (S**30**). After the processing of S**30**, it is confirmed whether pairing with the mobile terminal **50** has been established (S**31**). In the processing of S**31**, if the pairing has not been established (S**31**: No), the processing of S**30** onwards is repeated.

In the processing of S**31**, if the pairing with the mobile terminal **50** has been established (S**31**: Yes), it is confirmed

whether a request for the device registration data from the mobile terminal **50** has been received by the BT communication part **5** (S**32**). In the processing of S**32**, if the request for the device registration data has been received (S**32**: Yes), the device registration data of the communication device **1**, that is, the device identifier of the device identifier **11***b* and the product information of the product information **11***c*, are transmitted to the mobile terminal **50** by the BT communication part **5** (S**33**). After the processing of S**33**, the processing of S**32** onwards is repeated.

In the processing of S**32**, if no request for the device registration data has been received (S**32**: No), it is confirmed whether a request for the list of APs **90** has been received from the mobile terminal **50** by the BT communication part **5** (S**34**). In the processing of S**34**, if the request for the list of APs **90** has been received (S**34**: Yes), standby is performed until the list of APs **90** is created by the processing of S**51** of the Wi-Fi communication part setup processing (see FIG. **17**) to be described later (S**35**). After the processing of S**35**, the created list of APs **90** is transmitted to the mobile terminal **50** from the BT communication part **5** (S**36**). After the processing of S**36**, the processing of S**32** onwards is repeated.

In the processing of S**34**, if no request for the list of APs **90** has been received (S**34**: No), it is confirmed whether the information (AP information) about the AP **90** selected by the user H and the input PSW (AP password) of the AP **90** have been received from the mobile terminal **50** (S**37**). In the processing of S**37**, if the information about the AP **90** and the input PSW have been received (S**37**: Yes), the received information about the AP **90** and the received input PSW are acquired (S**38**).

The information about the AP **90** and the input PSW acquired by the processing of S**38** are respectively stored in the AP information **11***d* and the AP password **11***e*. The information about the AP **90** and the input PSW stored in the AP information **11***d* and the AP password **11***e* will be used in the connection to the AP **90** after the setup mode.

In the processing of S**37**, if the information about the AP **90** and the input PSW have not been received (S**37**: No), the processing of S**32** onwards is repeated. After the processing of S**38**, the BT communication part setup processing is ended. The end of the BT communication part setup processing after the processing of S**38** may be on standby until the connection of the Wi-Fi communication part **4** to the AP **90** succeeds in the processings of S**54** and S**55** to be described later.

After the processing of S**38**, the communication device **1** may notify the electronic musical instrument **30** that the information about the AP **90** and the input PSW have been acquired. Upon receiving the notification, the electronic musical instrument **30** may restart the communication device **1**. The restarted communication device **1** may connect to the AP **90** based on the information about the AP **90** and the input PSW stored in the AP information **11***d* and the AP password **11***e*, and may execute the processings after the setup mode.

FIG. **16** is a flowchart of the Wi-Fi main processing (S**3**). In the Wi-Fi main processing, first, it is confirmed whether the operation button **2** of the communication device **1** has been pressed and held and there is an instruction for the setup mode (S**40**). In the processing of S**40**, if there is an instruction for the setup mode (S**40**: Yes), the Wi-Fi communication part setup processing (S**41**) is executed. Herein, the Wi-Fi communication part setup processing will be described with reference to FIG. **17**.

FIG. **17** is a flowchart of the Wi-Fi communication part setup processing (S**41**). In the Wi-Fi communication part setup processing, first, it is confirmed whether the request for the list of APs **90** has been received from the mobile terminal **50** by the BT communication part **5** (S**50**). In the processing of S**50**, if the request for the list of APs **90** has been received (S**50**: Yes), a search is performed for the APs **90** that can be connected by the Wi-Fi communication part **4** and a list of the searched APs **90** is created (S**51**). After the processing of S**51**, the processing of S**50** onwards is repeated.

In the processing of S**50**, if no request for the list of APs **90** has been received (S**50**: No), it is confirmed whether the information (AP information) about the AP **90** selected by the user H and the input PSW (AP password) of the AP **90** have been received from the mobile terminal **50** by the BT communication part **5** (S**52**). In the processing of S**52**, if the information about the AP **90** and the input PSW have been received (S**52**: Yes), the AP **90** corresponding to the received information about the AP **90** is connected by the Wi-Fi communication part **4** by using the received input PSW (S**53**). In the processing of S**52**, if the information about the AP **90** and the input PSW have not been received (S**52**: No), the processing of S**50** onwards is repeated.

After the processing of S**53**, it is confirmed whether the connection to the AP **90** by the Wi-Fi communication part **4** has succeeded (S**54**). In the processing of S**54**, if the connection to the AP **90** has succeeded (S**54**: Yes), the fact ("connection successful") that the connection has succeeded is transmitted from the BT communication part **5** to the mobile terminal **50** (S**55**).

On the other hand, in the processing of S**54**, if the connection to the AP **90** has failed (S**54**: No), the fact (connection error) that the connection has failed is transmitted from the BT communication part **5** to the mobile terminal **50** (S**56**). After the processing of S**56**, the processing of S**50** onwards is repeated. After the processing of S**55**, the Wi-Fi communication part setup processing is ended.

Next, a processing of the setup mode of the mobile terminal **50** will be described. FIG. **18** is a flowchart of the mobile terminal setup processing (S**11**). In the mobile terminal setup processing, first, it is confirmed whether user registration of the user H with the server **70** has been completed (S**60**). In the processing of S**60**, if the user registration of the user H with the server **70** has not been completed (S**60**: No), the user registration of the user H is performed by transmitting the account (i.e., e-mail address) and password of the user H to the server **70** (S**61**). After the processing of S**61**, the processing of S**60** onwards is repeated.

In the processing of S**60**, if the user registration of the user H with the server **70** has been completed (S**60**: Yes), login to the server **70** is performed by transmitting the account and password of the user H to the server **70** by communication using the HTTPS protocol (S**62**). After the processing of S**62**, it is confirmed whether a response to the login received from the server **70** by communication using the HTTPS protocol is "OK" (S**63**).

In the processing of S**63**, if the response to the login is not "OK" (S**63**: No), display (error display) indicating that the login has failed is performed on the LCD **56** (S**64**). After the processing of S**64**, the processing of S**62** onwards is repeated.

In the processing of S**63**, if the response to the login is "OK" (S**63**: Yes), the HTTPS access authorization information is received from the server **70**. Then, pairing with the communication device **1** is performed by searching for the

communication device **1** by the BT communication part **60** (S**65**). After the processing of S**65**, it is confirmed whether pairing with the communication device **1** has been established (S**66**). In the processing of S**66**, if the pairing has not been established (S**66**: No), the processing of S**65** onwards is repeated.

In the processing of S**66**, if the pairing has been established (S**66**: Yes), the device registration data is requested from the communication device **1** by the BT communication part **60** (S**67**). After the processing of S**67**, it is confirmed whether the device registration data has been received from the communication device **1** by the BT communication part **60** (S**68**). In the processing of S**68**, if the device registration data has not been received (S**68**: No), the processing of S**68** is repeated.

In the processing of S**68**, if the device registration data has been received (S**68**: Yes), the received device registration data is transmitted to the server **70** from the base communication part **61** by communication using the HTTPS protocol (S**69**). At this time, the HTTPS access authorization information received by the processing of S**63** is included in the transmission.

After the processing of S**69**, it is confirmed whether a response to the transmission of the device registration data received from the server **70** by communication using the HTTPS protocol is "OK" (S**70**). In the processing of S**70**, if the response to the transmission of the device registration data is not "OK" (S**70**: No), display (error display) indicating that the transmission has failed is performed on the LCD **56** (S**71**). After the processing of S**71**, the processing of S**67** onwards is repeated. On the other hand, in the processing of S**70**, if the response to the transmission of the device registration data is "OK" (S**70**: Yes), a list of APs **90** is requested from the communication device **1** by the BT communication part **60** (S**72**).

After the processing of S**72**, it is confirmed whether the list of APs **90** has been received from the communication device **1** by the BT communication part **60** (S**73**). In the processing of S**73**, if the list of APs **90** has not been received (S**73**: No), the processing of S**73** is repeated. On the other hand, in the processing of S**73**, if the list of APs **90** has been received (S**73**: Yes), the received list of APs **90** is displayed on the LCD **56** (S**74**).

After the processing of S**74**, it is confirmed whether an AP **90** on the list displayed on the LCD **56** has been selected via the touch panel **57** and the input PSW (AP password) thereof has been inputted (S**75**). In the processing of S**75**, if the AP **90** has not been selected and the input PSW has not been inputted (S**75**: No), the processing of S**75** is repeated. On the other hand, in the processing of S**75**, if the AP **90** has been selected and the input PSW has been inputted (S**75**: Yes), the information about the AP **90** and the input PSW are transmitted to the communication device **1** by the BT communication part **60** (S**76**).

After the processing of S**76**, it is confirmed whether a result of connection to the AP **90** has been received from the communication device **1** by the BT communication part **60** (S**77**). In the processing of S**77**, if the result of connection to the AP **90** has not been received (S**77**: No), the processing of S**77** is repeated. On the other hand, in the processing of S**77**, if the result of connection to the AP **90** has been received (S**77**: Yes), it is confirmed whether the received result of connection is "connection successful" (S**78**).

In the processing of S**78**, if the received result of connection is "connection error" (S**78**: No), display (error display) indicating that the connection has failed is performed on the LCD **56** (S**79**), and the processing of S**74** onwards is repeated. On the other hand, in the processing of S**78**, if the received result of connection is "connection successful" (S**78**: Yes), the mobile terminal setup processing is ended.

Next, a processing of the setup mode of the server **70** will be described. FIG. **19** is a flowchart of the server setup processing (S**20**). In the server setup processing, first, standby is performed until communication using the HTTPS protocol occurs (S**80**). After the processing of S**80**, it is confirmed whether user registration has been requested from the mobile terminal **50** by communication using the HTTPS protocol (S**81**).

In the processing of S**81**, if the user registration has been requested (S**81**: Yes), it is confirmed whether the account received from the mobile terminal **50** is not registered in the user DB **72***b* (see FIG. **12**A) (S**82**). In the processing of S**82**, if the account received from the mobile terminal **50** is not registered in the user DB **72***b* (S**82**: Yes), the account and password received from the mobile terminal **50** and a uniquely created user identifier are registered in the user DB **72***b* (S**83**). After the processing of S**83**, the fact ("OK") that the received account has been registered in the user DB **72***b* is transmitted to the mobile terminal **50** by communication using the HTTPS protocol (S**84**).

On the other hand, in the processing of S**82**, if the account received from the mobile terminal **50** has been registered in the user DB **72***b* (S**82**: No), the fact (ERROR) that the received account has already been registered in the user DB **72***b* is transmitted to the mobile terminal **50** by communication using the HTTPS protocol (S**85**). After the processings of S**84** and S**85**, the processing of S**80** onwards is repeated.

In the processing of S**81**, if no request for user registration has been made (S**81**: No), it is confirmed whether login has been requested from the mobile terminal **50** by communication using the HTTPS protocol (S**86**). In the processing of S**86**, if login has been requested (S**86**: Yes), login is executed, and it is confirmed whether the login has succeeded (S**87**). In the processing of S**87**, if the login has succeeded (S**87**: Yes), the HTTPS access authorization information of the logged-in user H is created (S**88**).

After the processing of S**88**, the created HTTPS access authorization information and the fact ("OK") that the login has succeeded are transmitted to the mobile terminal **50** by communication using the HTTPS protocol (S**89**).

On the other hand, in the processing of S**87**, if the login has failed (S**87**: No), the fact (ERROR) is transmitted by communication using the HTTPS protocol (S**90**). After the processings of S**89** and S**90**, the processing of S**80** onwards is repeated.

In the processing of S**86**, if it is not a login request (S**86**: No), it is confirmed whether the device registration data has been received from the mobile terminal **50** by communication using the HTTPS protocol (S**91**). In the processing of S**91**, if the device registration data has been received (S**91**: Yes), it is confirmed whether a device identifier in the received device registration data exists in the device DB **72***c* (S**92**).

In the processing of S**92**, if the device identifier in the received device registration data exists in the device DB **72***c* (S**92**: Yes), product information of the received device registration data and the user identifier of the logged-in user H acquired from the user DB **72***b* are stored to an area for the device identifier of the received device registration data in the device DB **72***c* (S**93**). After the processing of S**93**, the fact ("OK") that the received device registration data has

been successfully registered in the device DB **72***c* is transmitted by communication using the HTTPS protocol (S**94**).

On the other hand, in the processing of S**92**, if the device identifier in the received device registration data does not exist in the device DB **72***c* (S**92**: No), the fact ("ERROR") that the device registration data is not one belonging to a regular communication device **1** is transmitted by communication using the HTTPS protocol (S**95**). After the processings of S**94** and S**95**, the server setup processing is ended.

Next, processings of the communication device **1**, the mobile terminal **50**, and the server **70** after the setup mode will be described. First, a processing of the communication device **1** after the setup mode will be described with reference to FIG. **16** and FIG. **20**.

In the processing of S**40** of FIG. **16**, if there is no instruction for the setup mode (S**40**: No), the AP **90** is connected by the Wi-Fi communication part **4** by using the information about the AP **90** and the input PSW acquired by the processing of FIG. **15** described above (S**42**). After the processing of S**42**, it is confirmed whether connection to the AP **90** can be established (S**43**).

In the processing of S**43**, if the AP **90** can be connected (S**43**: Yes), a Wi-Fi communication part workflow processing (S**44**) is performed. Details of the Wi-Fi communication part workflow processing will be described later.

On the other hand, if the AP **90** cannot be connected (S**43**: No), it is confirmed whether the number of attempts to connect to the AP **90** has reached an upper limit of the number (e.g., 10 times) of retries (S**45**). In the processing of S**45**, if the number of attempts to connect to the AP **90** has not reached the upper limit of the number of retries (S**45**: No), the processing of S**42** onwards is repeated; if the upper limit of the number of retries has been reached (S**45**: Yes), an error is displayed by blinking the LED **3** (S**46**). After the processings of S**41**, S**44**, and S**46**, the Wi-Fi main processing is ended.

Herein, the Wi-Fi communication part workflow processing of S**44** will be described with reference to FIG. **20**. FIG. **20** is a flowchart of the Wi-Fi communication part workflow processing (S**44**). In the Wi-Fi communication part workflow processing, first, the server **70** is connected in order to perform communication using the MQTT protocol (S**100**).

After the processing of S**100**, it is confirmed whether the server **70** can be connected by the processing of S**100** (S**101**). In the processing of S**101**, if the server **70** cannot be connected (S**101**: No), the processing of S**100** onwards is repeated.

On the other hand, in the processing of S**101**, if the server **70** can be connected (S**101**: Yes), a request topic of authorization information (i.e., the user identifier and the HTTPS access authorization information) is transmitted to the server **70** by the Wi-Fi communication part **4** by using MQTT protocol communication (S**102**). Such a request topic includes the device identifier of the communication device **1**. The processings of S**100** and S**102** are not necessarily executed according to a judgment made by the communication device **1**. For example, in the case where the electronic musical instrument **30** recognizes that the communication device **1** is connected to the server **70**, the processings of S**100** and S**102** may also be executed by giving instructions to the communication device **1** from the electronic musical instrument **30**.

After the processing of S**102**, it is confirmed whether the user identifier and the HTTPS access authorization information have been received from the server **70** by the Wi-Fi communication part **4** by communication using the MQTT protocol (S**103**). In the processing of S**103**, if the user identifier and the HTTPS access authorization information have not been received (S**103**: No), the processing of S**103** is repeated.

On the other hand, in the processing of S**103**, if the user identifier and the HTTPS access authorization information have been received (S**103**: Yes), the received user identifier and HTTPS access authorization information are transmitted to the electronic musical instrument **30** via the external IF **15** (S**104**). Hereinafter, communication between the communication device **1** and the electronic musical instrument **30** in the Wi-Fi communication part workflow processing is assumed to be performed via the external IF **15**.

The HTTPS access authorization information is not necessarily transmitted to the electronic musical instrument **30**, but may, for example, be stored in the communication device **1**. At that time, if the HTTPS access authorization information is required for communication using the HTTPS protocol, the electronic musical instrument **30** may instruct the communication device **1** to add the HTTPS access authorization information to the transmission. By doing so, since the HTTPS access authorization information can be prevented from leaking from the external IFs **15** and **37**, security in the communication between the electronic musical instrument **30** and the server **70** can be improved.

In the electronic musical instrument **30**, an instruction for utilizing a resource such as timbre data is created for the server **70** by using the user identifier and the HTTPS access authorization information received from the communication device **1**. Details thereof will be described with reference to FIG. **21**B in the electronic musical instrument workflow processing to be described later.

After the processing of S**104**, subscription registration is performed with respect to the server **70** by the user identifier received by the processing of S**103** and the device identifier of the device identifier **11***b* (S**105**). From this point on, the communication device **1** becomes able to receive MQTT data including the topic "topic/{user identifier}/{device identifier}/#".

By transmitting the MQTT data including the topic from the mobile terminal **50** to the server **70**, the communication device **1** receives the MQTT data from the server **70**. A result obtained by receiving the MQTT data from the communication device **1** or the mobile terminal **50** and processing the same by the server **70** is transmitted to the communication device **1** as the MQTT data including the topic. In this way, the communication device **1** becomes able to exchange commands or data with the server **70** or with the mobile terminal **50** via the server **70**.

After the processing of S**105**, various events in the communication device **1** are confirmed (S**106**). In the processing of S**106**, if the MQTT data, i.e., a topic from the server **70** and a payload transmitted together with the topic, are received from the server **70** (S**106**: receive MQTT data from server), the MQTT data is transmitted to the electronic musical instrument **30** via the external IF **15** (S**107**). Herein, the MQTT data refers to a topic and a payload transmitted together with the topic. This payload includes information accompanying instructions for the electronic musical instrument **30** or the server **70**, a resource such as timbre data requested from the server **70**, a result of processing by the server **70**, etc.

In the processing of S**106**, if the MQTT data is received from the electronic musical instrument **30** (S**106**: receive MQTT data from electronic musical instrument), the MQTT data is transmitted to the server **70** by communication using MQTT (S**108**).

In the processing of S106, if an HTTPS request is received from the electronic musical instrument 30 (S106: receive HTTPS request from electronic musical instrument), the HTTPS request is transmitted to the server 70 by communication using the HTTPS protocol (S109).

In the processing of S106, if an HTTPS response is received from the server 70 (S106: receive HTTPS response from server), the HTTPS response is transmitted to the electronic musical instrument 30 (S110). On the other hand, if no event has been received in the processing of S106 (S106: "no event"), or, after the processings of S107 to S110, the processing of S106 onwards is repeated.

Next, the processing of the electronic musical instrument 30 will be described with reference to FIG. 21A and FIG. 21B. FIG. 21A is a flowchart of the electronic musical instrument main processing. The electronic musical instrument main processing is a processing executed after power-on of the electronic musical instrument 30.

In the electronic musical instrument main processing, first, an electronic musical instrument upon-startup processing (S110) is performed. The electronic musical instrument upon-startup processing is a processing executed at the time of startup of the electronic musical instrument 30 and will be described later with reference to FIG. 33 to FIG. 35. After the electronic musical instrument upon-startup processing of S110, the electronic musical instrument workflow processing (S111) is performed, and other processings (S112) related to the electronic musical instrument 30 are performed, and then the processing of S111 onwards is repeated. Herein, the electronic musical instrument workflow processing of S111 will be described with reference to FIG. 21B.

FIG. 21B is a flowchart of the electronic musical instrument workflow processing. In the electronic musical instrument workflow processing, first, it is confirmed whether the user identifier and the HTTPS access authorization information have been received from the communication device 1 via the external IF 37 (S130). Hereinafter, communication between the electronic musical instrument 30 and the communication device 1 in the electronic musical instrument workflow processing is assumed to be performed via the external IF 37.

In the processing of S130, if the user identifier and the HTTPS access authorization information have been received (S130: Yes), the received user identifier and HTTPS access authorization information are acquired (S131). On the other hand, in the processing of S130, if the user identifier and the HTTPS access authorization information have not been received (S130: No), the processing of S131 is skipped.

After the processings of S130 and S131, various events are confirmed in the electronic musical instrument 30 (S132). In the processing of S132, if there is an event (S132: "there is event"), an electronic musical instrument event processing (S133) is executed; if there is no event (S132: "no event"), the processing of S132 onwards is repeated. The electronic musical instrument event processing of S133 will be described later with reference to FIG. 30.

Next, a processing of the mobile terminal 50 after the setup mode will be described with reference to FIG. 22. FIG. 22 is a flowchart of the mobile terminal workflow processing (S12). In the mobile terminal workflow processing, first, the user H logs in to the server 70 by communication using the HTTPS protocol (S140).

After the processing of S140, it is confirmed whether a response to the login received from the server 70 by communication using the HTTPS protocol is "OK" (S141). In the processing of S141, if the response to the login is not "OK" (S141: No), display (error display) indicating that the login has failed is performed on the LCD 56 (S142). After the processing of S142, the processing of S140 onwards is repeated.

On the other hand, in the processing of S141, if the response to the login is "OK" (S141: Yes), the HTTPS access authorization information received from the server 70 is acquired together with the response to the login (S143). The acquired HTTPS access authorization information will be used in subsequent HTTPS protocol communication from the mobile terminal 50 to the server 70. After the processing of S143, the user identifier of the user H is requested from the server 70 by communication using the HTTPS protocol (S144). At this time, the HTTPS access authorization information received by the processing of S63 in FIG. 18 is also transmitted. After the processing of S144, it is confirmed whether a response to the request for the user identifier is "OK" (S145).

In the processing of S145, if the response to the request for the user identifier is not "OK" (S145: No), display (error display) indicating that the request for the user identifier has failed is performed on the LCD 56 (S146). After the processing of S146, the processing of S144 onwards is repeated. In the processing of S145, if the response to the request for the user identifier is "OK" (S145: Yes), the user identifier is acquired from the server 70 (S147).

After the processing of S147, a device identifier corresponding to the acquired user identifier is requested from the server 70 by communication using the HTTPS protocol (S148). At this time, the HTTPS access authorization information received by the processing of S63 in FIG. 18 is also transmitted. After the processing of S148, it is confirmed whether a response to the request for the device identifier is "OK" (S149). In the processing of S149, if the response to the request for the device identifier is not "OK" (S149: No), display (error display) indicating that the request for the device identifier has failed is performed on the LCD 56 (S150). After the processing of S150, the processing of S148 onwards is repeated. In the processing of S149, if the response to the request for the device identifier is "OK" (S149: Yes), the device identifier is acquired from the server 70 (S151).

After the processing of S151, the server 70 is connected in order to perform communication using the MQTT protocol (S152). After the processing of S152, it is confirmed whether the server 70 can be connected by the processing of S152 (S153). In the processing of S153, if the server 70 cannot be connected (S153: No), the processing of S152 onwards is repeated.

In the processing of S153, if the server 70 can be connected (S153: Yes), subscription registration is performed with respect to the server 70 by the user identifier received by the processing of S147 and the device identifier received by the processing of S151 (S154). From this point on, the mobile terminal 50 becomes able to receive MQTT data including the topic "topic/{user identifier}/{device identifier}/# (#: any command such as data request or data)".

By transmitting the MQTT data including the topic from the communication device 1 to the server 70, the mobile terminal 50 receives the MQTT data from the server 70. A result obtained by receiving the MQTT data from the communication device 1 or the mobile terminal 50 and processing the same by the server 70 is transmitted to the mobile terminal 50 as the MQTT data including the topic. In this way, the mobile terminal 50 becomes able to exchange commands or data with the server 70 or with the communication device 1 via the server 70.

After the processing of S**154**, various events of the mobile terminal **50** are confirmed (S**155**). In the processing of S**155**, if there is an event (S**155**: "there is event"), a mobile terminal event processing (S**156**) is executed; if there is no event (S**155**: "no event"), the processing of S**155** onwards is repeated. The mobile terminal event processing of S**156** will be described later with reference to FIG. **25**.

Next, a processing of the server **70** after the setup mode will be described with reference to FIG. **23** and FIG. **24**. FIG. **23** is a flowchart of the HTTPS workflow processing (S**21**). In the HTTPS workflow processing, first, it is confirmed whether login has been requested from the mobile terminal **50** by communication using the HTTPS protocol (S**160**).

In the processing of S**160**, if login has been requested (S**160**: Yes), login is executed, and it is confirmed whether the login has succeeded (OK) (S**161**). In the processing of S**161**, if the login has succeeded (S**161**: Yes), the HTTPS access authorization information of the logged-in user H is created (S**162**). After the processing of S**162**, a response of "OK" to the login is transmitted together with the created HTTPS access authorization information to the mobile terminal **50** by communication using the HTTPS protocol (S**163**).

On the other hand, in the processing of S**161**, if the login has failed (S**161**: No), a response of "ERROR" to the login is transmitted to the mobile terminal **50** by communication using the HTTPS protocol (S**164**). After the processings of S**163** and S**164**, the processing of S**160** onwards is repeated.

In the processing of S**160**, if it is not a login request (S**160**: No), it is confirmed whether a request for a user identifier has been made from the mobile terminal **50** by communication using the HTTPS protocol (S**165**). In the processing of S**165**, if a request for the user identifier has been made (S**165**: Yes), a user identifier corresponding to the account of the user H of the mobile terminal **50** that made the request is acquired from the user DB **72***b* (S**166**). After the processing of S**166**, the acquired user identifier and a response of "OK" to the request for the user identifier are transmitted to the mobile terminal **50** by communication using the HTTPS protocol (S**167**). After the processing of S**167**, the processing of S**160** onwards is repeated.

In the processing of S**165**, if it is not a request for the user identifier (S**165**: No), it is confirmed whether a request for a device identifier has been made from the mobile terminal **50** by communication using the HTTPS protocol (S**168**). In the processing of S**168**, if a request for the device identifier has been made (S**168**: Yes), a user identifier corresponding to the account of the user H of the mobile terminal **50** that made the request is acquired from the user DB **72***b*, and a device identifier corresponding to the user identifier is further acquired from the device DB **72***c* (S**169**).

After the processing of S**169**, the acquired device identifier and a response of "OK" to the request for the device identifier are transmitted to the mobile terminal **50** by communication using the HTTPS protocol (S**170**). After the processing of S**170**, the processing of S**160** onwards is repeated.

In the processing of S**168**, if it is not a request for the device identifier (S**168**: No), a server HTTPS event processing (S**171**) is executed, and the processing of S**160** onwards is repeated. The server HTTPS event processing of S**171** will be described later with reference to FIG. **28**.

FIG. **24** is a flowchart of the MQTT workflow processing (S**22**). In the MQTT workflow processing, first, standby is performed until communication connection using the MQTT protocol occurs (S**190**). After the processing of S**190**, it is confirmed whether a connection has been made by communication using the MQTT protocol (S**191**). In the processing of S**191**, if no connection has been made by communication using the MQTT protocol (S**191**: No), the processing of S**190** onwards is repeated.

On the other hand, in the processing of S**191**, if a connection has been made by communication using the MQTT protocol (S**191**: Yes), it is further confirmed whether an MQTT data has been received (S**192**).

In the processing of S**192**, if the MQTT data has been received (S**192**: Yes), a topic of the received MQTT data is acquired (S**193**). After the processing of S**193**, the MQTT data received by the processing of S**192** is transmitted to a terminal (i.e., the communication device **1** or the mobile terminal **50**) that subscribes to the acquired topic (S**194**).

Accordingly, since the MQTT data received from the communication device **1** or the mobile terminal **50** is transmitted to the mobile terminal **50** or the communication device **1** used by the same user H, the MQTT data transmitted from the communication device **1** or the mobile terminal **50** can be utilized and managed at the terminals of both devices.

After the processing of S**194**, it is confirmed whether the topic acquired by the processing of S**193** includes a command that needs to be processed by the server **70** (S**195**). In the processing of S**195**, if the acquired topic includes a command that needs to be processed by the server **70** (S**195**: Yes), it is confirmed whether the command of the topic relates to a request for authorization information (i.e., user identifier and HTTPS access authorization information) from the communication device **1** (S**196**).

In the processing of S**196**, if it relates to a request for authorization information from the communication device **1** (S**196**: Yes), a user identifier corresponding to the device identifier of the communication device **1** that received the request is acquired from the device DB **72***c*, and the HTTPS access authorization information is created from the acquired user identifier (S**197**). After the processing of S**197**, the user identifier acquired and the HTTPS access authorization information created by the processing of S**197** are transmitted to the communication device **1** that made the request by communication using the MQTT protocol (S**198**).

On the other hand, in the processing of S**196**, if it is not related to the request for authorization information from the communication device **1** (S**196**: No), the server MQTT event processing (S**199**) is executed. The server MQTT event processing of S**199** will be described later with reference to FIG. **27**.

Next, the event processing in each of the mobile terminal **50**, the server **70**, and the electronic musical instrument **30** will be described. In the event processing, the loading, the writing, and the installation described with reference to FIG. **4** to FIG. **7** are mainly processed. First, the event processing of the mobile terminal **50** will be described with reference to FIG. **25**.

FIG. **25** is a flowchart of the mobile terminal event processing (S**156**). In the mobile terminal event processing, first, a mobile terminal loading processing (S**210**), a mobile terminal writing processing (S**211**), and a mobile terminal installation processing (S**212**) are executed. These processings will be described with reference to FIG. **26**A to FIG. **26**C.

FIG. **26**A is a flowchart of the mobile terminal loading processing (S**210**). The mobile terminal loading processing is a processing related to loading in the mobile terminal **50**. In the mobile terminal loading processing, first, it is con-

firmed whether loading has been instructed via the touch panel **57** (S**230**). In the processing of S**230**, if loading has been instructed (S**230**: Yes), an MQTT data is created with the topic being "instruction for loading timbre data" and the payload being "identifier of timbre data" specified via the touch panel **57**. The topic of such an MQTT data includes the user identifier of the user H and the device identifier of the device registration data of the communication device **1** acquired by the processing of S**67** of FIG. **18**. The created MQTT data is transmitted to the server **70** by communication using the MQTT protocol (S**231**).

In the processing of S**230**, if loading has not been instructed (S**230**: No), the processing of S**231** is skipped. After the processings of S**230** and S**231**, the mobile terminal loading processing is ended.

FIG. **26**B is a flowchart of the mobile terminal writing processing (S**211**). The mobile terminal writing processing is a processing related to writing in the mobile terminal **50**. In the mobile terminal writing processing, first, it is confirmed whether writing has been instructed via the touch panel **57** (S**240**). In the processing of S**240**, if writing has been instructed (S**240**: Yes), an MQTT data is created with the topic being "instruction for writing timbre data" and the payload being "identifier of timbre data" specified via the touch panel **57**. The topic of such an MQTT data includes the device identifier of the device registration data of the communication device **1** and the user identifier of the user H. The created MQTT data is transmitted to the server **70** by communication using the MQTT protocol (S**241**).

In addition, "identifier indicating writing destination area" may also be included in the payload of the MQTT data transmitted by the processing of S**241**. Such an MQTT data is also transmitted from the server **70** to the electronic musical instrument **30** in the processing of S**270** to be described later. Then, when the electronic musical instrument **30** stores the timbre data received from the server **70** by the processing of S**335** to be described later, the timbre data received from the server **70** may be stored to an area of the timbre memory **32***b* corresponding to "identifier indicating writing destination area" included in the payload of the MQTT data received by the processing of S**270**.

In the processing of S**240**, if writing has not been instructed (S**240**: No), the processing of S**241** is skipped. After the processings of S**240** and S**241**, the mobile terminal writing processing is ended.

FIG. **26**C is a flowchart of the mobile terminal installation processing (S**212**). The mobile terminal installation processing is a processing related to installation in the mobile terminal **50**. In the mobile terminal installation processing, first, it is confirmed whether installation has been instructed via the touch panel **57** (S**250**).

In the processing of S**250**, if installation has been instructed (S**250**: Yes), an MQTT data is created with the topic being "installability of wave data" and the payload being "size of wave data (specified via touch panel **57**)". The topic of such an MQTT data includes the device identifier of the device registration data of the communication device **1** and the user identifier of the user H. The created MQTT data is transmitted to the server **70** by communication using the MQTT protocol (S**251**). In the processing of S**250**, if installation has not been instructed (S**250**: No), the processing of S**251** is skipped.

After the processings of S**250** and S**251**, it is confirmed whether the topic of the MQTT data received from the server **70** is "installability" (S**252**). Specifically, it is confirmed whether the device identifier of the device registration data of the communication device **1**, the user identifier of the user H, and "installability" are all included in the topic of the received MQTT data. In the processing of S**252**, if the topic of the received MQTT data is "installability" (S**252**: Yes), it is confirmed whether the payload of the MQTT data received by the processing of S**252** is "installable" (S**253**).

In the processing of S**253**, if the payload is "installable" (S**253**: Yes), an HTTPS request requesting creation of a URL of the wave data (specified via the touch panel **57**) is transmitted to the server **70** by communication using the HTTPS protocol (S**254**). At this time, the HTTPS access authorization information acquired by the processing of S**143** in FIG. **22** is also transmitted.

After the processing of S**254**, the URL of the wave data requested by the processing of S**254** is received from the server **70** (S**255**). After the processing of S**255**, an MQTT data is created with the topic being "instruction for installing wave data" and the payload being "URL of wave data" received by the processing of S**255**, and the created MQTT data is transmitted to the server **70** by communication using the MQTT protocol (S**256**).

In the processing of S**253**, if the payload is not "installable" (S**253**: No), display (error display) indicating that the wave data cannot be installed is performed on the LCD **56** (S**257**). In the processing of S**252**, if the topic of the received MQTT data is not "installability" (S**252**: No), or, after the processings of S**256** and S**257**, the mobile terminal installation processing is ended.

Returning to FIG. **25**, after the mobile terminal installation processing of S**212**, it is confirmed whether the topic of the MQTT data received from the server **70** is "progress notification" (S**213**). Specifically, it is confirmed whether the device identifier of the device registration data of the communication device **1**, the user identifier of the user H, and "progress notification" are all included in the topic of the received MQTT data. In the processing of S**213**, if the topic of the received MQTT data is "progress notification" (S**213**: Yes), a progress rate is acquired from the payload of the received MQTT data (S**214**), and the progress rate is confirmed (S**215**).

In the processing of S**215**, if the progress rate is 100% (S**215**: "100%"), display indicating that the writing or installation is completed is performed on the LCD **56** (S**216**). In the processing of S**215**, if the progress rate is 0 to 99% (S**215**: "0 to 99%"), the progress rate is displayed on the LCD **56** (S**217**). In the processing of S**215**, if "error" is stored instead of the progress rate (S**215**: "ERROR"), display (error display) indicating that the writing or installation has failed is performed on the LCD **56** (S**218**).

In the processing of S**213**, if the topic of the received MQTT data is not "progress notification" (S**213**: No), or, after the processings of S**216** to S**218**, it is confirmed whether the topic of the MQTT data received from the server **70** is "sync completed" (S**219**). Specifically, it is confirmed whether the device identifier of the device registration data of the communication device **1**, the user identifier of the user H, and "sync completed" are all included in the topic of the received MQTT data.

In the processing of S**219**, if the topic of the received MQTT data is "sync completed" (S**219**: Yes), an HTTPS request requesting the sync data **72***e* is transmitted to the server **70** by communication using the HTTPS protocol (S**220**). At this time, the HTTPS access authorization information acquired by the processing of S**143** in FIG. **22** is also transmitted. After the processing of S**220**, the sync data **72***e* is received from the server **70** (S**221**), and display based on the received sync data **72***e* is performed on the LCD **56** (S**222**).

In the processing of S**219**, if the topic of the received MQTT data is not "sync completed" (S**219**: No), or, after the processing of S**222**, other processings (S**223**) are executed, and the mobile terminal event processing is ended. Examples of other processings of S**223** include: creating an MQTT data or an HTTPS request corresponding to an instruction inputted to the mobile terminal **50** and transmitting to the server **70**; analyzing an MQTT data received by the mobile terminal **50** and performing a processing according to the MQTT data; and performing a processing according to an HTTPS response from the server **70**.

Next, the event processing in the communication using the MQTT protocol of the server **70** will be described with reference to FIG. **27**. FIG. **27** is a flowchart of the server MQTT event processing (S**199**). In the server MQTT event processing, first, it is confirmed whether an MQTT data with the topic being "instruction for loading timbre data" has been received (S**260**).

In the processing of S**260**, if an MQTT data with the topic being "instruction for loading timbre data" has been received (S**260**: Yes), it is confirmed whether the timbre data corresponding to the identifier included in the payload of the received MQTT data can be loaded (used) by the user identifier of the user H who has transmitted the MQTT data (S**261**). Specifically, with reference to the management information **72***g*, it is confirmed whether the user H has already purchased the timbre data corresponding to the identifier included in the payload of the received MQTT data, or whether the timbre data can be used with the subscription authority of the user H.

In the processing of S**261**, if the timbre data can be loaded (S**261**: Yes), the timbre data corresponding to the identifier of the timbre data of the payload of the MQTT data received by the processing of S**260** is acquired from the timbre DB **72***d* (S**262**). After the processing of S**262**, an MQTT data is created with the topic being "instruction for loading timbre data" and the payload being "timbre data" acquired by the processing of S**262**. The topic of such an MQTT data includes the device identifier and the user identifier of the topic received by the processing of S**260**. The created MQTT data is transmitted to the devices (i.e., the electronic musical instrument **30** and the mobile terminal **50**) registered for subscription by the device identifier and the user identifier of the topic received by the processing of S**260** (S**263**).

If an MQTT data with the topic being "instruction for loading timbre data" has not been received in the processing of S**260** (S**260**: No), if the timbre data cannot be loaded in the processing of S**261** (S**261**: No), or, after the processing of S**263**, it is confirmed whether an MQTT data with the topic being "update of load history" has been received (S**264**). In the processing of S**264**, if an MQTT data with the topic being "update of load history" has been received (S**264**: Yes), the identifier of the timbre data of the payload of the received MQTT data is acquired (S**265**).

After the processing of S**265**, **1** is added to the load count corresponding to the user identifier of the topic of the MQTT data and the acquired identifier of the timbre data in the load history **72***f* (S**266**).

In the processing of S**264**, if an MQTT data with the topic being "update of load history" has not been received (S**264**: No), or, after the processing of S**266**, it is confirmed whether an MQTT data with the topic being "instruction for writing timbre data" has been received (S**267**). In the processing of S**267**, if an MQTT data with the topic being "instruction for writing timbre data" has been received (S**267**: Yes), it is confirmed whether the timbre data corresponding to the identifier included in the payload of the received MQTT data can be written (used) by the user identifier of the user H who has transmitted the MQTT data (S**268**).

Specifically, with reference to the management information **72***g*, it is confirmed whether the user H has already purchased the timbre data corresponding to the identifier included in the payload of the received MQTT data, or whether the timbre data can be used with the subscription authority of the user H. In the processing of S**268**, if the timbre data can be written (S**268**: Yes), a URL is created for acquiring the timbre data of the identifier of the payload of the received MQTT data from the timbre DB **72***d* (S**269**).

After the processing of S**269**, an MQTT data is created with the topic being "instruction for writing timbre data" and the payload being "URL" created by the processing of S**269**. The topic of such an MQTT data includes the device identifier and the user identifier of the topic received by the processing of S**267**. The created MQTT data is transmitted to the devices (i.e., the electronic musical instrument **30** and the mobile terminal **50**) registered for subscription by the device identifier and the user identifier of the topic received by the processing of S**267** (S**270**).

If an MQTT data with the topic being "instruction for writing timbre data" has not been received in the processing of S**267** (S**267**: No), if the timbre data cannot be written in the processing of S**268** (S**268**: No), or after the processing of S**270**, it is confirmed whether an MQTT data with the topic being "management information request" indicating a request for management information has been received (S**271**). In the processing of S**271**, if an MQTT data with the topic being "management information request" has been received (S**271**: Yes), first, a user identifier corresponding to the "device identifier" in the topic of the received MQTT data (i.e., "topic/{user identifier}/{device identifier}/"management information request") is acquired from the device DB **72***c*. Then, management information of the acquired user identifier, i.e., the personal management information **72***g***1** corresponding to the user identifier of the user H of the request source device and the shared management information **72***g***2** are acquired from the management information **72***g* (see FIG. **13** respectively). Next, an MQTT data is created with the topic being "management information transmission" indicating transmission of management information and the payload being the acquired management information, and the MQTT data is transmitted (returned) to the above request source device (S**272**).

The user identifier is acquired from the device DB **72***c* corresponding to the "device identifier" in the topic of the MQTT data received in S**271**, and the management information corresponding to the user identifier is acquired from the management information **72***g*, but the disclosure is not limited thereto. Management information corresponding to the "user identifier" in the topic of the MQTT data received in S**271** may also be acquired from the management information **72***g*.

In the processing of S**271**, if an MQTT data with the topic being "management information request" has not been received (S**271**: No), or after the processing of S**272**, other processings (S**273**) are performed, and the server MQTT event processing is ended. Examples of other processings of S**273** include transmitting an MQTT data other than the above received from the communication device **1** (the electronic musical instrument **30**) or the mobile terminal **50** to another device registered for subscription.

As described above, in the server MQTT event processing, if the topic of a specific MQTT data is received in the processings of S**260**, S**264**, and S**267**, the server **70** executes

a necessary processing in advance, and the processing result and the topic of the received MQTT data are transmitted to another device registered for subscription. Accordingly, in the electronic musical instrument **30** or the mobile terminal **50** to which the MQTT data is transmitted, after receiving the MQTT data, since it is not necessary to request the server **70** to perform a processing according to the topic of the MQTT data, resources on the server **70** can be used more quickly.

Further, the processing result of a specific command is registered to the server **70** for subscription without being transmitted to another device, and by transmitting an MQTT data with the command as the topic to the server **70**, it is possible to have the server **70** perform only the processing according to the specific command. Thereby, the MQTT data can be used as a processing request for the server **70** (not intended to be transmitted to another device).

Next, the event processing in the communication using the HTTPS protocol of the server **70** will be described with reference to FIG. **28** and FIG. **29**. FIG. **28** is a flowchart of the server HTTPS event processing (S**171**). In the server HTTPS event processing, first, it is confirmed whether an HTTPS request being an acquisition request using a URL of a timbre data or a wave data has been received (S**280**).

In the processing of S**280**, if an HTTPS request being an acquisition request has been received (S**280**: Yes), it is confirmed whether there is no problem with the HTTPS access authorization information received together with the URL in the HTTPS request (S**281**). In the processing of S**281**, the user identifier may be confirmed instead of the HTTPS access authorization information, or both the HTTPS access authorization information and the user identifier may be confirmed. In the processing of S**281**, if there is no problem with the HTTPS access authorization information and the user identifier (S**281**: Yes), together with a response "OK", the timbre data or the wave data specified by the URL is transmitted to the request source of the HTTPS request by communication using the HTTPS protocol (S**282**).

On the other hand, in the processing of S**281**, if there is a problem with the HTTPS access authorization information or the user identifier (S**281**: No), a response "NG" is transmitted to the request source of the HTTPS request by communication using the HTTPS protocol (S**283**).

In the processing of S**280**, if an HTTPS request being an acquisition request has not been received (S**280**: No), or, after the processings of S**282** and S**283**, it is confirmed whether an HTTPS request being a request for creating a URL of a wave data has been received (S**284**). In the processing of S**284**, if an HTTPS request being a request for creating a URL of a wave data has been received (S**284**: Yes), it is confirmed whether there is no problem with the HTTPS access authorization information received in the HTTPS request (S**285**). In the processing of S**285**, the user identifier may be confirmed instead of the HTTPS access authorization information, or both the HTTPS access authorization information and the user identifier may be confirmed.

In the processing of S**285**, if there is no problem with the HTTPS access authorization information and the user identifier (S**285**: Yes), together with a response "OK" to the request source of the HTTPS request, a URL for acquiring the specified wave data from the timbre DB **72***d* is transmitted to the request source of the HTTPS request by communication using the HTTPS protocol (S**286**). On the other hand, in the processing of S**285**, if there is a problem with the HTTPS access authorization information or the user identifier (S**285**: No), a response "NG" is transmitted to the request source of the HTTPS request by communication using the HTTPS protocol (S**287**).

In the processing of S**284**, if an HTTPS request being a request for creating a URL of a wave data has not been received (S**284**: No), or, after the processings of S**286** and S**287**, a server sync processing (S**288**) is executed. Herein, the server sync processing will be described with reference to FIG. **29**.

FIG. **29** is a flowchart of the server sync processing (S**288**). The server sync processing is a processing related to the update of the sync data **72***e* in the server **70**. In the server sync processing, first, it is confirmed whether an HTTPS request being a sync instruction request has been received (S**300**). In the processing of S**300**, if an HTTPS request being a sync instruction request has been received (S**300**: Yes), it is confirmed whether there is no problem with the HTTPS access authorization information received in the HTTPS request (S**301**).

In the processing of S**301**, if there is no problem with the HTTPS access authorization information (S**301**: Yes), by storing the identifier and attribute information of the timbre data or the wave data received in the HTTPS request to the sync data **72***e*, the sync data **72***e* is updated (S**302**).

After the processing of S**302**, an MQTT data is created with the topic being "sync completed" and the payload being "COMPLETED". The topic of such an MQTT data includes the device identifier and the user identifier of the request source of the HTTPS request received by the processing of S**300**. The created MQTT data is transmitted to a device registered for subscription by the device identifier and the user identifier of the request source of the HTTPS request (S**303**).

On the other hand, in the processing of S**301**, if there is a problem with the HTTPS access authorization information (S**301**: No), a response "NG" is transmitted to the request source of the HTTPS request by communication using the HTTPS protocol (S**304**).

In the processing of S**300**, if an HTTPS request being a sync instruction request has not been received (S**300**: No), or, after the processings of S**303** and S**304**, it is confirmed whether an HTTPS request being a request for the sync data **72***e* has been received (S**305**). In the processing of S**305**, if an HTTPS request being a request for the sync data **72***e* has been received (S**305**: Yes), it is confirmed whether there is no problem with the HTTPS access authorization information received in the HTTPS request (S**306**). In the processing of S**306**, the user identifier may be confirmed instead of the HTTPS access authorization information, or both the HTTPS access authorization information and the user identifier may be confirmed.

In the processing of S**306**, if there is no problem with the HTTPS access authorization information and the user identifier (S**306**: Yes), together with a response "OK", the sync data **72***e* is transmitted to the request source of the HTTPS request by communication using the HTTPS protocol (S**307**). On the other hand, in the processing of S**306**, if there is a problem with the HTTPS access authorization information or the user identifier (S**306**: No), a response "NG" is transmitted to the request source of the HTTPS request by communication using the HTTPS protocol (S**308**). In the processing of S**305**, if an HTTPS request being a request for the sync data **72***e* has not been received (S**305**: No), or, after the processings of S**307** and S**308**, the server sync processing is ended.

Returning to FIG. **28**, after the server sync processing of S**288**, other processings (S**289**) are executed, and the server

HTTPS event processing is end. Examples of other processings of S**289** include a processing of performing a processing for an HTTPS request other than the above received from the communication device **1** or the mobile terminal **50**, and transmitting the result as an HTTPS response by communication using the HTTPS protocol.

The event processing in the electronic musical instrument **30** will be described with reference to FIG. **30** to FIG. **32**. FIG. **30** is a flowchart of the electronic musical instrument event processing (S**133**). In the electronic musical instrument event processing, first, it is confirmed whether the topic of an MQTT data received from the server **70** is "instruction for loading timbre data" (S**320**). Specifically, it is confirmed whether the device identifier of the device registration data of the communication device **1**, the user identifier received by the processing of S**131** in FIG. **21**B, and "instruction for loading timbre data" are all included in the topic of the received MQTT data.

In the processing of S**320**, if the topic of the received MQTT data is "instruction for loading timbre data" (S**320**: Yes), the timbre data is acquired from the payload of the received MQTT data and stored to the work memory **33***a* (S**321**). After the processing of S**321**, an MQTT data is created with the topic being "update of load history" and the payload being "identifier of timbre data" stored in the work memory **33***a*. The topic of such an MQTT data includes the device identifier of the communication device **1** and the user identifier received by the processing of S**131** in FIG. **21**B. The created MQTT data is transmitted to the server **70** by communication using the MQTT protocol (S**322**).

In the processing of S**320**, if the topic of the received MQTT data is not "instruction for loading timbre data" (S**320**: No), or, after the processing of S**322**, an electronic musical instrument writing processing (S**323**) and an electronic musical instrument installation processing (S**324**) are executed. Herein, these processings will be described with reference to FIG. **31** and FIG. **32**.

FIG. **31** is a flowchart of the electronic musical instrument writing processing (S**323**). The electronic musical instrument writing processing is a processing related to the writing in the electronic musical instrument **30**. In the electronic musical instrument writing processing, first, it is confirmed whether the topic of an MQTT data received from the server **70** is "instruction for writing timbre data" (S**330**). Specifically, it is confirmed whether the device identifier of the device registration data of the communication device **1**, the user identifier received by the processing of S**131** in FIG. **21**B, and "instruction for writing timbre data" are all included in the topic of the received MQTT data.

In the processing of S**330**, if the topic of the received MQTT data is "instruction for writing timbre data" (S**330**: Yes), an HTTPS request being an acquisition request for a timbre data of a URL of the payload of the received MQTT data is transmitted to the server **70** by communication using the HTTPS protocol (S**331**). At this time, the HTTPS access authorization information acquired by the processing of S**131** in FIG. **21**B is also transmitted.

After the processing of S**331**, it is confirmed whether a response to the acquisition request of the processing of S**331** is "OK" (S**332**). In the processing of S**332**, if the response is "OK" (S**332**: Yes), an MQTT data is created with the topic being "progress notification" and the payload being a value (0 to 99%) according to a rate of receiving the timbre data. The topic of such an MQTT data includes the device identifier of the communication device **1** and the user identifier received by the processing of S**131** in FIG. **21**B. The created MQTT data is transmitted to the server **70** by communication using the MQTT protocol (S**333**).

After the processing of S**333**, it is confirmed whether reception of the timbre data is completed (S**334**). In the processing of S**334**, if reception of the timbre data is not completed (S**334**: No), the processing of S**333** onwards is repeated. On the other hand, in the processing of S**334**, if reception of the timbre data is completed (S**334**: Yes), the received timbre data is stored to the timbre memory **32***b* (S**335**).

After the processing of S**335**, an MQTT data is created with the topic being "progress notification" and the payload being "100%". The topic of the MQTT data includes the device identifier of the communication device **1** and the user identifier received by the processing of S**131** in FIG. **21**B. The created MQTT data is transmitted to the server **70** by communication using the MQTT protocol (S**336**).

After the processing of S**336**, an HTTPS request being a sync instruction request is transmitted to the server **70** by communication using the HTTPS protocol (S**337**). At this time, the identifier and attribute information of the written timbre data and the HTTPS access authorization information acquired by the processing of S**131** in FIG. **21**B are also transmitted.

In the processing of S**332**, if the response is not "OK" (S**332**: No), an MQTT data is created with the topic being "progress notification" and the payload being "ERROR". The topic of such an MQTT data includes the device identifier of the communication device **1** and the user identifier received by the processing of S**131** in FIG. **21**B. The created MQTT data is transmitted to the server **70** by communication using the MQTT protocol (S**338**).

In the processing of S**330**, if the topic of the received MQTT data is not "instruction for writing timbre data" (S**330**: No), or, after the processings of S**337** and S**338**, the electronic musical instrument writing processing is ended.

FIG. **32** is a flowchart of the electronic musical instrument installation processing (S**324**). The electronic musical instrument installation processing is a processing related to the installation in the electronic musical instrument **30**. In the electronic musical instrument installation processing, first, it is confirmed whether the topic of an MQTT data received from the server **70** is "installability" (S**350**). Specifically, it is confirmed whether the device identifier of the communication device **1**, the user identifier received by the processing of S**131** in FIG. **21**B, and "installability" are all included in the topic of the received MQTT data.

In the processing of S**350**, if the topic of the received MQTT data is "installability" (S**350**: Yes), it is confirmed whether a wave data in a size set in the payload of the received MQTT data can be stored to the wave memory **32***c* (S**351**). In the processing of S**351**, if the wave data can be stored to the wave memory **32***c* (S**351**: Yes), an MQTT data is created with the topic being "installability" and the payload being "installable". The topic of such an MQTT data includes the device identifier of the communication device **1** and the user identifier received by the processing of S**131** in FIG. **21**B. The created MQTT data is transmitted to the server **70** by communication using the MQTT protocol (S**352**).

On the other hand, in the processing of S**351**, if the wave data cannot be stored to the wave memory **32***c* (S**351**: No), an MQTT data is created with the topic being "installability" and the payload being "not installable". The topic of such an MQTT data includes the device identifier of the communication device **1** and the user identifier received by the

processing of S131 in FIG. 21B. The created MQTT data is transmitted to the server 70 by communication using the MQTT protocol (S353).

In the processing of S350, if the topic of the received MQTT data is not "installability" (S350: No), or, after the processings of S352 and S353, it is confirmed whether the topic of the MQTT data received from the server 70 is "instruction for installing wave data" (S354). Specifically, it is confirmed whether the device identifier of the communication device 1, the user identifier received by the processing of S131 in FIG. 21B, and "instruction for installing wave data" are all included in the topic of the received MQTT data.

In the processing of S354, if the topic of the received MQTT data is "instruction for installing wave data" (S354: Yes), an acquisition request for the wave data of the URL of the payload of the received MQTT data is transmitted to the server 70 by communication using the HTTPS protocol (S355). At this time, the HTTPS access authorization information acquired by the processing of S131 in FIG. 21B is also transmitted.

After the processing of S355, it is confirmed whether a response to the acquisition request of the processing of S355 is "OK" (S356). In the processing of S356, if the response is "OK" (S356: Yes), an MQTT data is created with the topic being "progress notification" and the payload being a value (0 to 99%) according to a rate of receiving the wave data. The topic of such an MQTT data includes the device identifier of the communication device 1 and the user identifier received by the processing of S131 in FIG. 21B. The created MQTT data is transmitted to the server 70 by communication using the MQTT protocol (S357).

After the processing of S357, it is confirmed whether reception of the wave data is completed (S358). In the processing of S358, if reception of the wave data is not completed (S358: No), the processing of S357 onwards is repeated. On the other hand, in the processing of S358, if reception of the wave data is completed (S358: Yes), the received wave data is stored to the wave memory 32*c* (S359).

After the processing of S359, an MQTT data is created with the topic being "progress notification" and the payload being "100%". The topic of the MQTT data includes the device identifier of the communication device 1 and the user identifier received by the processing of S131 in FIG. 21B. The created MQTT data is transmitted to the server 70 by communication using the MQTT protocol (S360).

After the processing of S360, an HTTPS request being a sync instruction request is transmitted to the server 70 by communication using the HTTPS protocol (S361). At this time, the identifier and attribute information of the installed wave data and the HTTPS access authorization information acquired by the processing of S131 in FIG. 21B are also transmitted.

In the processing of S356, if the response is not "OK" (S356: No), an MQTT data is created with the topic being "progress notification" and the payload being "ERROR". The topic of such an MQTT data includes the device identifier of the communication device 1 and the user identifier received by the processing of S131 in FIG. 21B. The created MQTT data is transmitted to the server 70 by communication using the MQTT protocol (S362).

In the processing of S354, if the topic of the received MQTT data is not "instruction for installing wave data" (S354: No), or, after the processings of S361 and S362, the electronic musical instrument installation processing is ended.

Returning to FIG. 30, after the electronic musical instrument installation processing of S324, it is confirmed whether setting of the livelock flag 32*e* has been instructed via the setting key 35 (S325). In the processing of S325, if setting of the livelock flag 32*e* has been instructed (S325: Yes), the state of the livelock flag 32*e* is confirmed (S326). In the processing of S326, if the livelock flag 32*e* is off (S326: "off"), the livelock flag 32*e* is set to on (S327); and if the livelock flag 32*e* is on (S326: "on"), the livelock flag 32*e* is set to off (S328).

In the processing of S325, if setting of the livelock flag 32*e* has not been instructed (S325: No), or after the processings of S327 and S328, other processings (S329) are executed, and the electronic musical instrument event processing is ended. Examples of other processings of S329 include: in the case where an instruction for the server 70 is inputted from the user H via the setting key 35 of the electronic musical instrument 30, creating an MQTT data or an HTTPS request according to the instruction and transmitting to the communication device 1; in the case where another MQTT data is received from the server 70, analyzing the received MQTT data and performing a processing according to the analyzed MQTT data; and in the case where an HTTPS response is received from the server 70, performing a processing according to the received HTTPS response.

Next, referring to FIG. 33 to FIG. 35, the processing at the time of startup of the electronic musical instrument 30 will be described. FIG. 33 is a flowchart of the electronic musical instrument upon-startup processing (S110). In the electronic musical instrument upon-startup processing, first, an upon-startup confirmation processing (S380) is executed. Herein, the upon-startup confirmation processing will be described with reference to FIG. 34.

FIG. 34 is a flowchart of the upon-startup confirmation processing. In the upon-startup confirmation processing, first, 1 is set as a counter variable M indicating a reference position (i.e., "No." in FIG. 10B) of the content state table 32*d* (S390). After the processing of S390, the license type of the Mth sound data in the content state table 32*d* is confirmed (S391).

In the processing of S391, if the license type of the Mth sound data in the content state table 32*d* is the subscription type (S391: "subscription"), it is confirmed whether "valid" is stored in the Mth item of the content state table 32*d* (S392). In the processing of S392, if "valid" is stored in the Mth item of the content state table 32*d* (S392: Yes), it is confirmed whether the value of the power-on counter 32*f* is smaller than 1 (S393).

In the processing of S393, if the value of the power-on counter 32*f* is smaller than 1 (S393: Yes), because the power of the electronic musical instrument 30 has been turned on 10 times since the communication with the server 70 turned into an unestablishable state, the Mth sound data of the subscription type in the content state table 32*d* is set to be invalid (S394). Accordingly, the sound data becomes unusable by the electronic musical instrument 30.

In the processing of S392, if "invalid" is stored in the Mth item of the content state table 32*d* (S392: No), it means that in the content state table 32*d* updated in a previous round by S398 and S421 (see FIG. 35) to be described later, the sound data invalidated due to expiration of the subscription authority or the like is set to be invalid by the processing of S394.

On the other hand, if the license type of the Mth sound data in the content state table 32*d* is the permanent type in the processing of S391 (S391: "permanent"), or if the value of the power-on counter 32*f* is 1 or more in the processing of S393 (S393: No), the Mth sound data of the subscription type

in the content state table **32***d* is validated (S**395**). Accordingly, the sound data becomes usable by the electronic musical instrument **30**.

After the processings of S**394** and S**395**, 1 is added to the counter variable M (S**396**), and it is confirmed whether the counter variable M is larger than the quantity of sound data in the content state table **32***d* (S**397**). In the processing of S**397**, if the counter variable M is equal to or less than the quantity of sound data in the content state table **32***d* (S**397**: No), the processing of S**391** onwards is performed.

In the processing of S**397**, if the counter variable M is larger than the quantity of sound data in the content state table **32***d* (S**397**: Yes), the state of the sound data set to be valid/invalid by the processings of S**394** and S**395** is reflected in the content state table **32***d* to update the content state table **32***d* (S**398**).

After the processing of S**398**, it is confirmed whether the livelock flag **32***e* is on (S**399**). In the processing of S**399**, if the livelock flag **32***e* is off (S**399**: No), it is confirmed whether the value of the power-on counter **32***f* is 1 or more (S**400**). In the processing of S**400**, if the value of the power-on counter **32***f* is 1 or more (S**400**: Yes), **1** is subtracted from the power-on counter **32***f* (S**401**).

On the other hand, in the processing of S**399**, if the livelock flag **32***e* is on (S**399**: Yes), or if the value of the power-on counter **32***f* is less than 1 (S**400**: No), the processing of S**401** is skipped. That is, if the livelock flag **32***e* is turned on, subtraction of the power-on counter **32***f* is not performed.

Accordingly, with the livelock flag **32***e* being turned on and the electronic musical instrument **30** being unable to be connected with the server **70**, even if the user H repeatedly turns on the power of the electronic musical instrument **30**, it is possible to prevent subscription-type sound data, which are dependent on the count of power-on of the electronic musical instrument **30**, from becoming unusable. Accordingly, the user H can use the subscription-type sound data by turning on the livelock flag **32***e* without concern.

After the processings of S**399** and S**401**, the upon-startup confirmation processing is ended.

Returning to FIG. **33**, after the upon-startup confirmation processing of S**380**, it is confirmed whether the livelock flag **32***e* is on (S**381**). In the processing of S**381**, if the livelock flag **32***e* is off (S**381**: No), it is confirmed whether the connection with the server **70** is successful (S**382**). Specifically, it is confirmed whether the communication device **1** is connected to Wi-Fi by the processing of S**43** in the Wi-Fi main processing of FIG. **16**, and the Wi-Fi communication part workflow processing of S**44** is executed.

In the processing of S**382**, if the connection with the server **70** is successful (S**382**: Yes), an upon-connection confirmation processing (S**383**) is executed. Herein, the upon-connection confirmation processing will be described with reference to FIG. **35**.

FIG. **35** is a flowchart of the upon-connection confirmation processing. In the upon-connection confirmation processing, first, an MQTT data with the topic being "management information request" (i.e., "topic/{user identifier}/{device identifier}/"management information request") is transmitted to the server **70** by communication using the MQTT protocol (S**410**). After the processing of S**410**, it is confirmed whether an MQTT data with the topic being "management information transmission" has been received from the server **70** (S**411**). In the processing of S**411**, if an MQTT data with the topic being "management information transmission" has been received (S**411**: Yes), management information is acquired from the payload of the received MQTT data and stored to the management information **33***b* (S**412**). On the other hand, in the processing of S**411**, if an MQTT data with the topic being "management information transmission" has not been received (S**411**: No), the processing of S**411** is repeated.

After the processing of S**412**, **1** is set as the counter variable M indicating the reference position of the content state table **32***d* (S**413**). After the processing of S**413**, the license type of the Mth sound data in the content state table **32***d* is confirmed (S**414**). In the processing of S**414**, if the license type of the Mth sound data in the content state table **32***d* is the subscription type (S**414**: "subscription"), it is confirmed according to the management information **33***b* whether the sound data has been purchased as the permanent type (S**415**).

In the processing of S**415**, if the Mth sound data in the content state table **32***d* has not been purchased as the permanent type (S**415**: No), it is confirmed according to the management information **33***b* whether the subscription authority of the Mth sound data in the content state table **32***d* is valid (S**416**).

In the processing of S**416**, if the subscription authority of the Mth sound data in the content state table **32***d* is invalid (S**416**: No), the Mth sound data of the subscription type in the content state table **32***d* is set to be invalid (S**417**). Accordingly, the sound data becomes unusable by the electronic musical instrument **30**.

On the other hand, if the license type of the Mth sound data in the content state table **32***d* is the permanent type in the processing of S**414** (S**414**: "permanent"), if the Mth sound data in the content state table **32***d* has been purchased as the permanent type in the processing of S**415** (S**415**: Yes), or if the subscription authority of the Mth sound data in the content state table **32***d* is valid in the processing of S**416** (S**416**: Yes), the Mth sound data of the subscription type in the content state table **32***d* is set to be valid (S**418**). Accordingly, the sound data becomes usable by the electronic musical instrument **30**.

After the processings of S**417** and S**418**, 1 is added to the counter variable M (S**419**), and it is confirmed whether the counter variable M is larger than the quantity of sound data in the content state table **32***d* (S**420**). In the processing of S**420**, if the counter variable M is equal to or less than the quantity of sound data in the content state table **32***d* (S**420**: No), the processing of S**414** onwards is performed.

In the processing of S**420**, if the counter variable M is larger than the quantity of sound data in the content state table **32***d* (S**420**: Yes), the state of the sound data set to be valid/invalid by the processings of S**417** and S**418** is reflected in the content state table **32***d* to update the content state table **32***d* (S**421**).

After the processing of S**421**, the power-on counter **32***f* is set to 10 (i.e., the initial value) in response to reception being possible from the management information from the server **70** (S**422**). After the processing of S**422**, the upon-connection confirmation processing is ended.

Returning to FIG. **33**, in the processing of S**382**, if the connection with the server **70** has failed (S**382**: No), it is confirmed whether a count of attempts to connect to the server **70** has reached an upper limit of a retry count (e.g., 10 times) (S**384**). In the processing of S**384**, if the count of attempts to connect to the server **70** is less than or equal to the retry count (S**384**: No), the processing of S**382** onwards is repeated. On the other hand, in the processing of S**384**, if the count of attempts to connect to the server **70** exceeds the retry count (S**384**: Yes), a notification (error display) that the

connection to the server **70** cannot be established is displayed on the LCD **36** (S**385**).

In the processing of S**381**, if the livelock flag **32***e* is on (S**381**: Yes), a limitation during turn-on of the livelock flag **32***e*, i.e., prohibition of storing timbre data to the timbre memory **32***b* and prohibition of adding new subscription-type sound data to the timbre memory **32***b* and the wave memory **32***c*, is instructed (S**386**). Afterwards, in the electronic musical instrument **30**, it becomes not allowable to store subscription-type timbre data to the timbre memory **32***b* and add new subscription-type sound data to the timbre memory **32***b* and the wave memory **32***c*. After the processings of S**383**, S**385**, and S**386**, the electronic musical instrument upon-startup processing is ended.

That is, if the connection to the server **70** can be established (S**382**: Yes), validity/invalidity of the sound data is set based on the management information acquired from the server **70** by the upon-connection confirmation processing of S**383**. On the other hand, if the connection to the server **70** cannot be established (S**382**: No), the upon-connection confirmation processing of S**383** is not executed, and validity/invalidity of the sound data is set based on the content state table **32***d* immediately before the connection to the server **70** becomes unestablishable according to the upon-startup confirmation processing of S**380** which has been previously executed.

Further, if the livelock flag **32***e* is on (S**381**: Yes), the upon-connection confirmation processing of S**382** is not executed, and validity/invalidity of the sound data is set based on the content state table **32***d* immediately before the livelock flag **32***e* is turned on according to the upon-startup confirmation processing of S**380** which has been previously executed. At this time, according to the processing of S**386**, storage of subscription-type timbre data and addition of new subscription-type sound data are prohibited.

By setting validity/invalidity of sound data by the upon-startup confirmation processing and the upon-connection confirmation processing immediately after the power of the electronic musical instrument **30** is turned on, it is possible to reliably set validity/invalidity of the sound data when the connection with the server **70** cannot be established or the livelock flag **32***e* is turned on. Further, the sound data that are newly usable by the user H by, for example, newly purchasing the subscription authority can be appropriately used on the electronic musical instrument **30**. On the other hand, it is possible to suppress illegally continuing to use the subscription-type sound data of the electronic musical instrument that has become unusable due to expiration of the subscription authority or a change to the subscription authority.

Further, management information is acquired from the server **70** by the upon-connection confirmation processing executed upon turn-on of the power of the electronic musical instrument **30**, and validity/invalidity of the sound data is set based on the management information. For example, when the time period of the subscription authority of the user H has expired, the sound data of the subscription authority is set to be invalid by the upon-connection confirmation processing upon turn-on of the power of the electronic musical instrument **30** after the expiration of the time period. Accordingly, it is possible to appropriately set validity/invalidity of sound data of a subscription authority having an expiration date in the electronic musical instrument **30** without connecting a device for managing the time and date such as a real-time clock (RTC) to the electronic musical instrument **30**.

Although the disclosure has been described based on the above embodiments, obviously various improvements or modifications may be made.

In the above embodiments, the communication device **1** is configured to be connected to the electronic musical instrument **30**. However, the disclosure is not limited thereto. The communication device **1** may also be built in the electronic musical instrument **30**, and the processing concerning the communication device **1** may also be executed by the electronic musical instrument **30**. In this case, the device identifier is set as an identifier uniquely set for each electronic musical instrument **30**, and such a device identifier or product information (i.e., device registration data) may be stored in the electronic musical instrument **30**.

In the above embodiments, the communication device **1** is provided with the AP information **11***d* and the AP password **11***e*, and the AP **90** is connected by using the information about the AP **90** and the input PSW stored in the AP information **11***d* and the AP password **11***e*. However, the disclosure is not limited thereto. For example, the information about the AP **90** and the input PSW received from the mobile terminal **50** may be stored to the electronic musical instrument **30** (e.g., the flash ROM **32**). When the communication device **1** is connected to the AP **90**, the information about the AP **90** and the input PSW stored in the electronic musical instrument **30** may be acquired from the electronic musical instrument **30**, and the AP **90** may be connected by using the acquired information about the AP **90** and the acquired input PSW.

In the above embodiments, the communication device **1** is provided with the operation button **2** and the LED **3**, and by pressing and holding the operation button **2**, the communication device **1** is caused to shift to the setup mode, and the LED **3** is caused to blink at this time. However, the disclosure is not limited thereto. For example, by a predetermined operation of the setting key **35** of the electronic musical instrument **30**, the communication device **1** may be caused to shift to the setup mode, and the LCD **36** may display that the communication device **1** is in the setup mode. In this case, the operation button **2** and the LED **3** may be omitted from the communication device **1**.

In the above embodiments, the server **70** creates the HTTPS access authorization information based on the user identifier of the user H and transmits the same to the communication device **1** and the mobile terminal **50**, and reception of resources is performed by communication using the HTTPS protocol based on the HTTPS access authorization information from the communication device **1** and the mobile terminal **50**. However, the authorization information created by the server **70** is not limited to the HTTPS access authorization information. The server **70** may create authorization information in other communication protocols and transmit the same to the communication device **1** and the mobile terminal **50**, and the communication device **1** and the mobile terminal **50** may receive resources from the server **70** by using the authorization information transmitted from the server **70**.

In the above embodiments, the AP **90** to be connected by Wi-Fi by the communication device **1** is selected by the user H by the mobile terminal **50**, and the input PSW is inputted by the user H by the mobile terminal **50**. However, the disclosure is not limited thereto. For example, in the case where the AP **90** that can be connected by the mobile terminal **50** is selected by the user H from the list of the APs **90** received from the communication device **1**, input of the input PSW by the user H by the mobile terminal **50** may be omitted, and a password used by the mobile terminal **50** for

connecting the AP **90** may be transmitted as the input PSW to the communication device **1**. Further, in the case where the AP **90** that can be connected by the mobile terminal **50** is included in the list of APs **90** received from the communication device **1**, selection of the AP **90** by the user H by the mobile terminal **50** may be omitted, the AP **90** that can be connected by the mobile terminal **50** may be automatically selected, and the information about the AP **90** concerning the AP **90** that can be connected by the mobile terminal **50** and a password used for connecting the AP **90** may be transmitted to the communication device **1**.

In the above embodiments, the load history **72***f* stores a load count of the timbre data, but the disclosure is not limited thereto. Instead of a load count, the date and time when the timbre data is stored to the work memory **33***a* may be stored. Accordingly, for example, when the user H instructs from the mobile terminal **50** to load the electronic musical instrument **30**, by preferentially displaying on the LCD **56** the timbre data frequently used on the date and time period of loading, it is possible to prompt the user H to use the timbre data preferred by the user H on this date and time period.

In the above embodiments, in the case where the communication with the server **70** cannot be established, the time period of setting validity or invalidity of the sound data based on the content state table **32***d* has been set to a time period from when the communication with the server **70** becomes unestablishable to when the power of the electronic musical instrument **30** has been turned on 10 times. However, the disclosure is not limited thereto, and the time period may also be set to end when the power of the electronic musical instrument **30** has been turned on 10 times or less (e.g., 5 times) or 10 times or more (e.g., 30 times). Further, the above number of times may be changed according to the user H. For example, the higher the rank of the subscription authority (e.g., "professional" and "ultimate") of the user H, or the larger the quantity (e.g., 10 or more) of permanent-type sound data purchased by the user H, the larger the above number of times (e.g., 50 times) may be set.

Further, in the case where the communication with the server **70** cannot be established, the time period of setting validity or invalidity of the sound data based on the content state table **32***d* may also be set to end when an operating time of the electronic musical instrument **30** accumulated since the communication with the server **70** turns into an unestablishable state reaches a predetermined time (e.g., 10 hours).

Further, in the electronic musical instrument **30**, in the case where the communication with the server **70** cannot be established, the mobile terminal **50** may receive the management information of the server **70**, the received management information may be transmitted from the mobile terminal **50** to the communication device **1** and the electronic musical instrument **30** via Bluetooth or the like, and validity or invalidity of the sound data of the electronic musical instrument **30** may be set based on the management information received by the electronic musical instrument **30**.

Further, the management information acquired from the server **70** may be stored to a storage medium such as a USB memory, and in the case where the electronic musical instrument **30** cannot communicate with the server **70**, the management information may be acquired from the storage medium connected to the external IF **37**, and validity and invalidity of the sound data may be set based on the acquired management information.

Further, in the time period of setting validity or invalidity of the sound data based on the content state table **32***d* in the case where the communication with the server **70** cannot be established, the same limitation on the sound data as in the case where the livelock flag **32***e* is turned on may also applied.

In the above embodiments, the limitation is imposed on the subscription-type sound data while the livelock flag **32***e* is on in the electronic musical instrument **30**. However, the disclosure is not limited thereto, and the limitation may also be imposed on the permanent-type sound data, and the limitation may also be imposed on both the subscription-type and the permanent-type sound data. Further, it is also possible not to impose a limitation on the sound data while the livelock flag **32***e* is on.

Further, as the limitation imposed while the livelock flag **32***e* is on, storage of subscription-type timbre data and addition of new subscription-type sound data are prohibited. However, the imposed limitation is not limited thereto, other limitations may also be imposed, such as prohibition of backup/restoration of sound data, prohibition of import/export of sound data, shortening of the time period of the subscription authority (e.g., shortening by one month per lock instruction). Further, turn-on of the livelock flag **32***e* may be allowed in the case where the user H is charged a predetermined amount of money (e.g., $10 is charged for each turn-on of the livelock flag **32***e*).

Further, the limitation imposed in the case where the livelock flag **32***e* is on may be changed according to the user H. For example, if the user H has a high rank of subscription authority (e.g., "professional" or "ultimate"), or if the quantity of permanent-type sound data purchased by the user H is large (e.g., 10 or more), the above limitation may be set to only one of prohibition of storage of subscription-type timbre data and prohibition of addition of new subscription-type sound data.

Further, in the above embodiments, subtraction of the power-on counter **32***f* is suppressed in the case where the livelock flag **32***e* is on (FIG. **34**, S**399** to S**401**). However, the disclosure is not limited thereto, and subtraction of the power-on counter **32***f* may also be performed in the case where the livelock flag **32***e* is on. Accordingly, even if the livelock flag **32***e* is on, in the case where the electronic musical instrument **30** continues to be unable to connect with the server **70** up to when the power of the electronic musical instrument **30** has been turned on 10 times, since the subscription-type sound data becomes unusable, it is possible to prevent the sound data from being used for an unreasonably long period of time.

In the above embodiments, the upon-connection confirmation processing of S**383** is executed in the case where the power of the electronic musical instrument **30** is turned on and the connection with the server **70** is successful (FIG. **33**, S**382**). However, the disclosure is not limited thereto, and the upon-connection confirmation processing may also be executed at any timing after the connection with the server **70** is successful. For example, by repeatedly executing the upon-connection confirmation processing at intervals of 10 minutes, the valid/invalid state of the sound data stored in the management information **72***g* of the server **70** can be reflected in the electronic musical instrument **30** in real time.

In the above embodiments, the communication system S is composed of the electronic musical instrument **30** to which the communication device **1** is connected, the mobile terminal **50**, and the server **70**. However, the disclosure is not limited thereto. The mobile terminal **50** may be equipped with the function of the server **70**, and the server **70** may be

omitted from the communication system S. Alternatively, the server **70** may be equipped with the function of the mobile terminal **50**, and the mobile terminal **50** may be omitted from the communication system S.

In the above embodiments, by connecting the communication device **1** to the AP **90** by Wi-Fi, and by connecting the AP **90** to the Internet N, the communication device **1** communicates with the server **70** via the Internet N. However, the disclosure is not limited thereto. For example, the communication device **1** may be connected to the base station **100** and be connected to the Internet N via the base station **100** in the same manner as the mobile terminal **50**. In this case, the base station **100** to which the communication device **1** is connected and the base station **100** to which the mobile terminal **50** is connected do not have to be the same base station. The communication device **1** may be connected to the AP **90** by a wireless communication standard other than Wi-Fi, or the communication device **1** and the Internet N may be connected by wired communication.

By connecting the mobile terminal **50** to the base station **100** and connecting the base station **100** to the Internet N, the mobile terminal **50** communicates with the server **70** via the Internet N. However, the disclosure is not limited thereto. For example, the mobile terminal **50** may be connected to the AP **90** by Wi-Fi and may be connected to the Internet N via the AP **90**. In this case, the AP **90** to which the communication device **1** is connected and the AP **90** to which the mobile terminal **50** is connected do not have to be the same access point. The mobile terminal **50** and the Internet N may also be connected by wired communication.

In the above embodiments, the communication device **1** and the mobile terminal **50** communicate with each other by Bluetooth. However, the disclosure is not limited thereto. For example, the communication device **1** and the mobile terminal **50** may be communicated by other short-range wireless communication standards such as ZigBee, or the communication device **1** and the mobile terminal **50** may be wire-connected for communication.

In the above embodiments, the mobile terminal **50** has been described as an example of the terminal to which an instruction is inputted from the user H. However, the disclosure is not limited thereto. For example, a personal computer or a tablet terminal may also serve as the terminal to which an instruction is inputted from the user H.

In the above embodiments, the electronic musical instrument **30** has been described as the electronic device to which the communication device **1** is connected. However, the disclosure is not limited thereto. A video device for processing a video or another device such as an audio device, a mixer, an effector, and an amplifier may also serve as the electronic device to which the communication device **1** is connected. At this time, as resources, instead of the sound data described above, the server **70** may store various data usable by the electronic device, such as video data, audio data, data concerning video editing such as scene switching, function expansion data which expand the functions of the electronic device, updater, automatic performance data, as well as content data such as tunes, lyrics, musical scores, etc. Further, by executing the control program **32***a* on a computer such as a PC or a tablet terminal, operations equivalent to those of the electronic musical instrument **30** of the above embodiments may be realized on the computer.

What is claimed is:

1. An electronic device connected to a server which stores, for each user, management information related to allowability of use of data of a subscription type permitted to be used within a predetermined period without being connected to a device for keeping and managing time and date, the electronic device comprising:

a storage which stores the data;

and a processor configured to:

establish a communication with the server to confirm, with the server, management information comprising a subscription authority of a desired level owned by a user of the electronic device, wherein the subscription authority indicates a contract type for the user to use the data and is set to a plurality of levels of authority for acquiring at least a portion of the data;

permit using, in the electronic device, data deemed usable at the desired level indicated by the subscription authority in the confirmed management information, among data of the subscription type stored in the storage;

prohibit using, in the electronic device, data deemed unusable in the confirmed management information, among data of the subscription type stored in the storage, comprising prohibiting storing edited timbre data in the storage;

accumulate a number of times that power of the electronic device has been turned on since the communication with the server became unestablishable;

and permit using, in the electronic device, the data of the subscription type stored in the storage based on the confirmed management information before communication with the server became unestablishable for a time period from when communication with the server becomes unestablishable to when the accumulated number of times reaches a predetermined number of times, comprising allowing storing edited timber data in the storage.

2. The electronic device according to claim **1**, wherein the processor confirms the management information of the user on the server based on information of the electronic device.

3. The electronic device according to claim **1**, wherein the processor confirms the management information of the user on the server based on information of the user who uses the electronic device.

4. The electronic device according to claim **1**, wherein the processor prohibits using, in the electronic device, data of the subscription type stored in the storage in a case where an unestablishable state of communication with the server has continued for the prescribed period or more.

5. The electronic device according to claim **1**, wherein the storage stores information of the data of the subscription type made usable by the processor in the confirmed management information, wherein in a case where communication with the server cannot be established, for a prescribed period, the processor permits using, in the electronic device, data of the subscription type stored in the storage based on the information of the data of the subscription type stored in the storage.

6. The electronic device according to claim **1**, wherein the confirming, the permitting and the prohibiting are executed after power of the electronic device is turned on.

7. The electronic device according to claim **1**, wherein the management information of the server stores, for each user, information related to allowability of use of data of a permanent type permitted to be used permanently, and the processor permits using, in the electronic device, data deemed usable in confirmed management information, among data of the permanent type stored in the storage.

8. The electronic device according to claim **1**, wherein the electronic device is an electronic musical instrument.

9. The electronic device according to claim 1, wherein the data are sound data.

10. The electronic device according to claim 1, wherein the data are function expansion data.

11. The electronic device according to claim 1, wherein the data are content data.

12. A data usage method executed in an electronic device connected to a server which stores, for each user, management information related to allowability of use of data of a subscription type permitted to be used within a predetermined period without being connected to a device for keeping and managing time and date, the data usage method comprising:

establishing a communication with the server to confirm, with the server, management information comprising a subscription authority owned by a user of the electronic device wherein the subscription authority indicates a desired level among a plurality of levels of authority for the use of data;

permitting using, in the electronic device, data deemed usable at the desired level indicated by the subscription authority in the confirmed management information, among data of the subscription type stored in a storage of the electronic device;

prohibiting using, in the electronic device, data deemed unusable in the confirmed management information, among data of the subscription type stored in the storage, comprising prohibiting storing edited timbre data in the storage;

accumulating a number of times that power of the electronic device has been turned on since the communication with the server became unestablishable; and

permitting using, in the electronic device, the data of the subscription type stored in the storage based on the confirmed management information before communication with the server became unestablishable for a time period from when communication with the server becomes unestablishable to when the accumulated number of times reaches a predetermined number of times, comprising allowing storing edited timber data in the storage.

13. A non-transitory computer readable recording medium, storing an electronic device program causing a computer to execute a usage processing of data of a subscription type permitted to be used within a predetermined period, wherein the computer comprises a storage and is connected to a server which stores, for each user, management information related to allowability of use of the data without being connected to a device for keeping and managing time and date, the electronic device program causing the computer to:

operate the storage which stores the data;

establish a communication with the server to confirm, with the server, management information comprising a subscription authority owned by the user of the computer, wherein the subscription authority indicates a desired level among a plurality of levels of authority for the use of data;

permit using data deemed usable at the desired level indicated by the subscription authority in the confirmed management information, among data of the subscription type stored in the storage;

prohibit using, in the computer, data deemed unusable in the confirmed management information, among data of the subscription type stored in the storage, comprising prohibiting storing edited timbre data in the storage;

accumulate a number of times that power of the electronic device has been turned on since the communication with the server became unestablishable; and

permit using the data of the subscription type stored in the storage based on the confirmed management information before communication with the server became unestablishable for a time period from when communication with the server becomes unestablishable to when the accumulated number of times reaches a predetermined number of times, comprising allowing storing edited timber data in the storage.

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