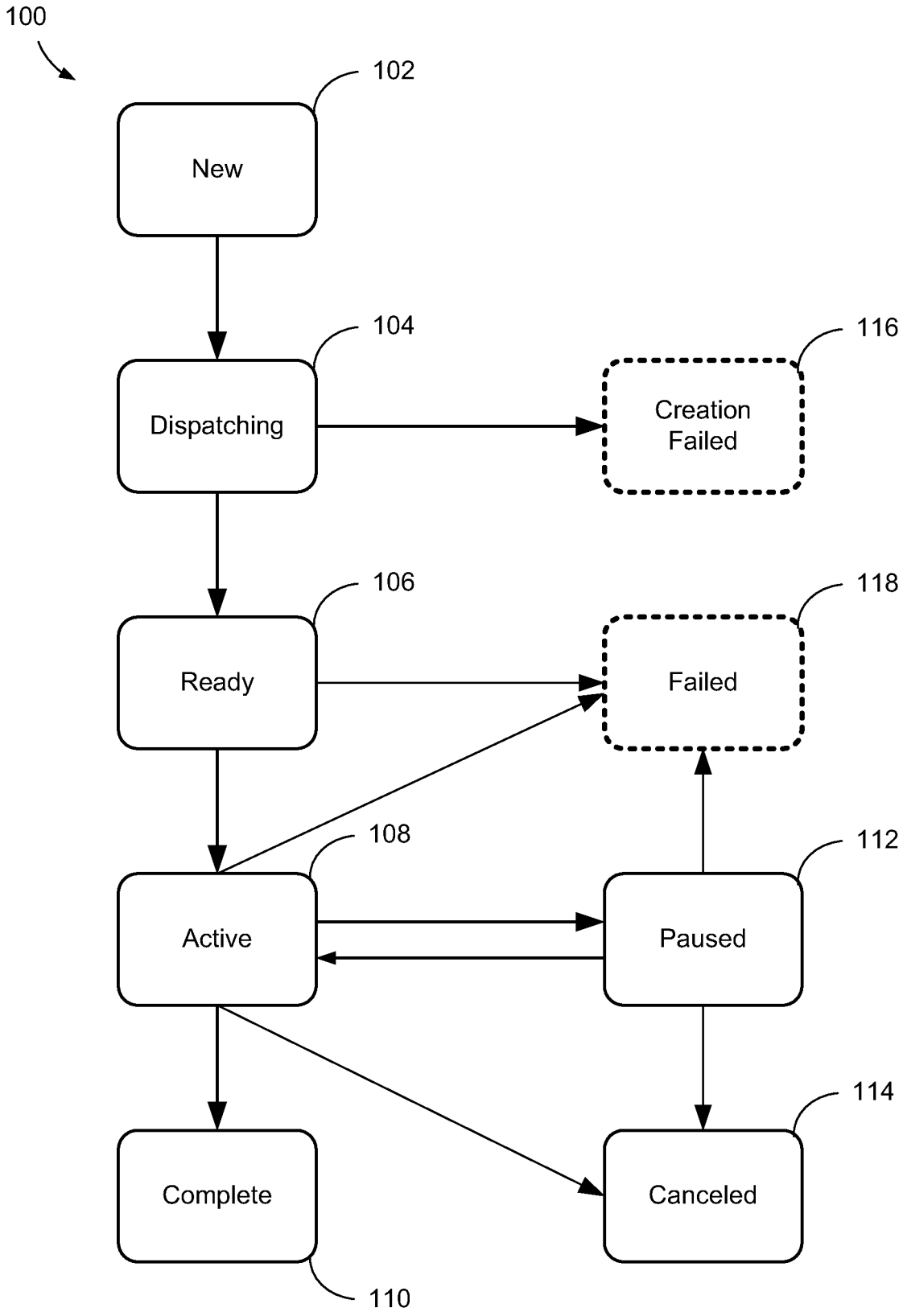

100
102
New
104
Dispatching
116
Creation Failed
106
Ready
118
Failed
108
Active
112
Paused
114
Canceled
Complete
110

FIG. 1

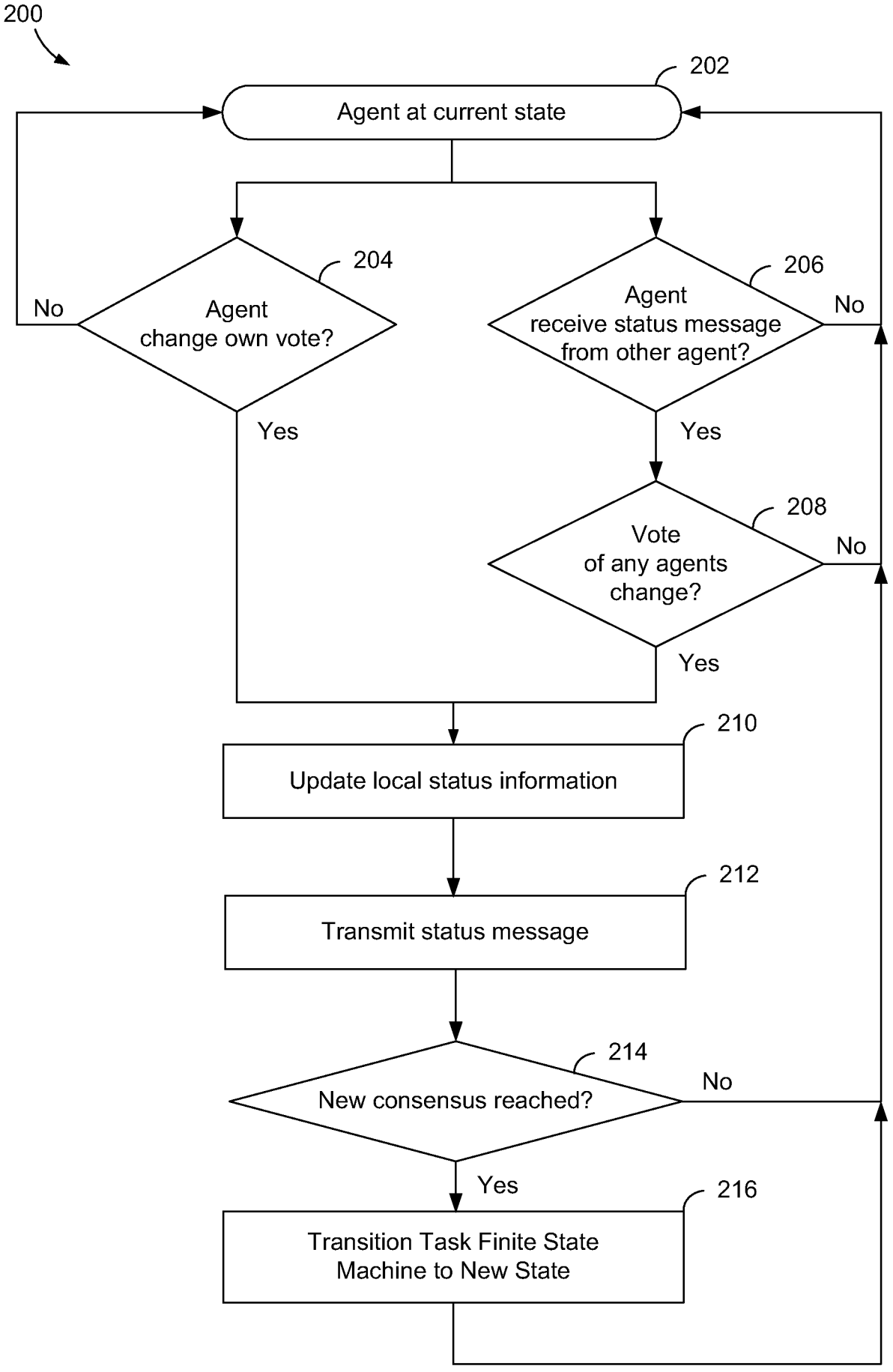

200
202
Agent at current state
204
Agent change own vote?
No
Yes
206
Agent receive status message from other agent?
No
Yes
208
Vote of any agents change?
No
Yes
210
Update local status information
212
Transmit status message
214
New consensus reached?
No
Yes
216
Transition Task Finite State Machine to New State

FIG. 2

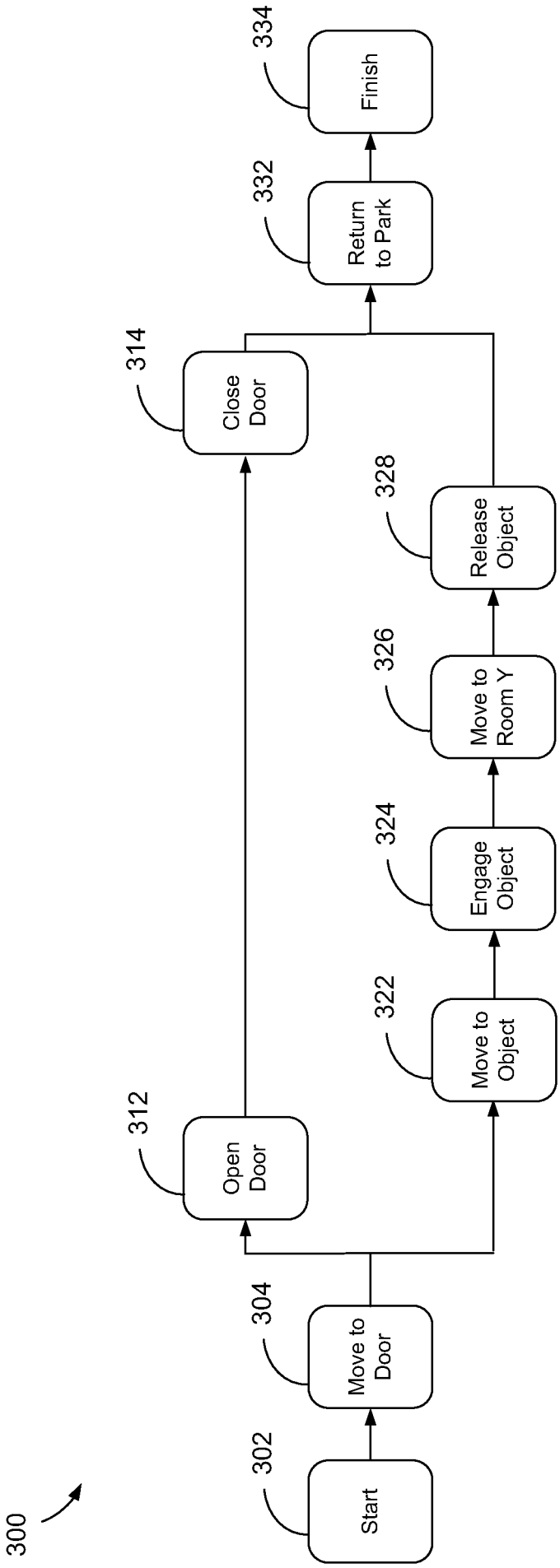

300
302
Start
304
Move to Door
312
Open Door
314
Close Door
322
Move to Object
324
Engage Object
326
Move to Room Y
328
Release Object
332
Return to Park
334
Finish

FIG. 3

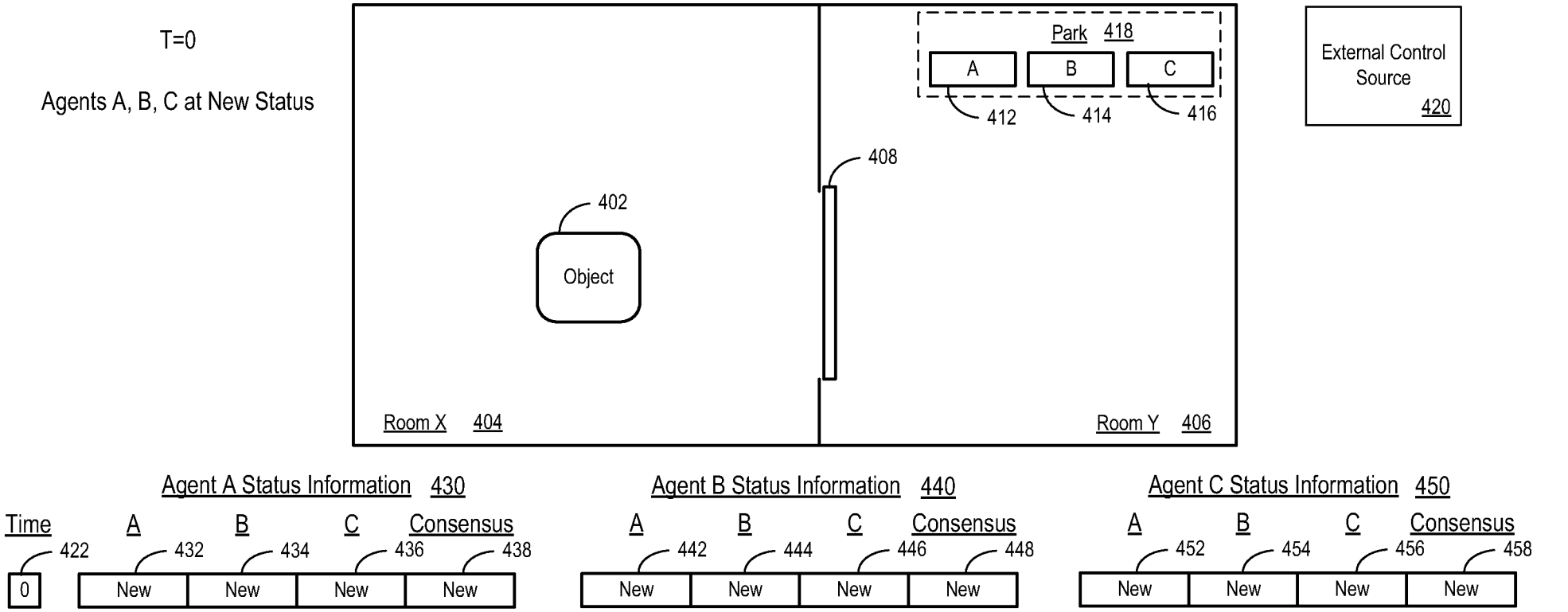
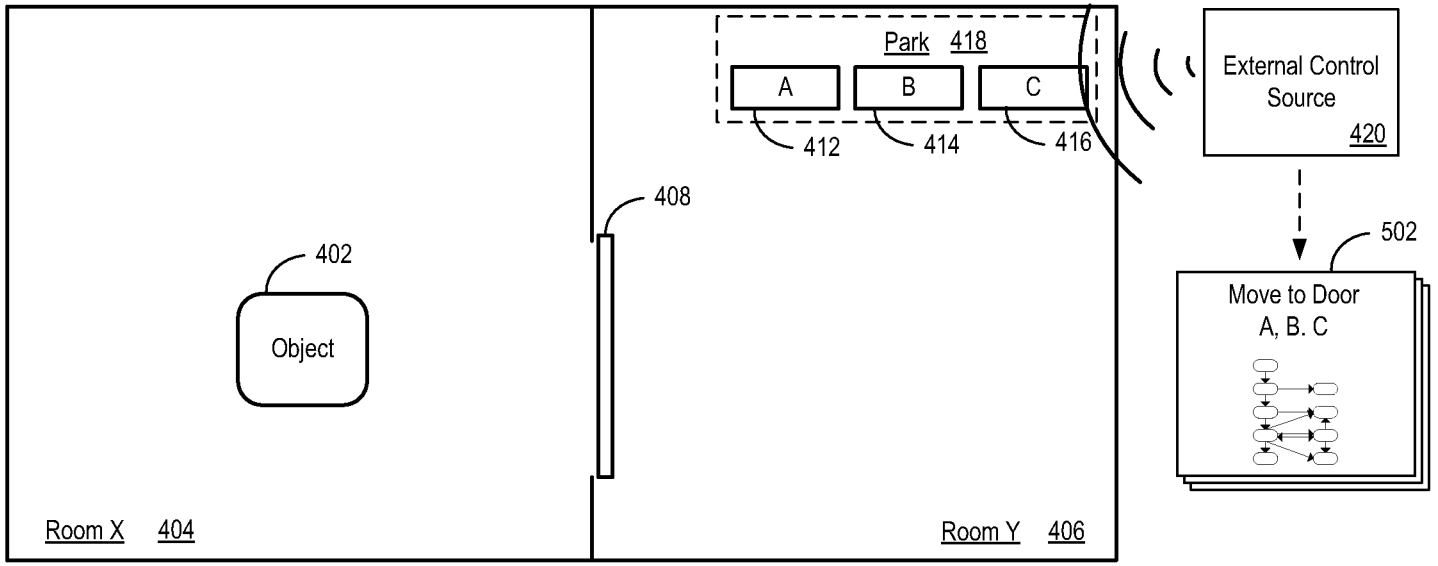

T=0
Agents A, B, C at New Status
Park 418
A
B
C
412
414
416
External Control Source 420
408
402
Object
Room X 404
Room Y 406
Agent A Status Information 430
Time
A
B
C
Consensus
422
432
434
436
438
0
New
New
New
New
Agent B Status Information 440
A
B
C
Consensus
442
444
446
448
New
New
New
New
Agent C Status Information 450
A
B
C
Consensus
452
454
456
458
New
New
New
New

FIG. 4

T=1, 1', 1", 1'"

Dispatching Task

Agents A, B, C (or a number or portion thereof) update status to dispatching



Agent A Status Information 430

Time	A	B	C	Consensus
422	432	434	436	438
0	New	New	New	New
522	532	534	536	538
1	Dispatching	Dispatching	Dispatching	Dispatching
522'	432	534	536	538'
1'	New	Dispatching	Dispatching	Dispatching
522"				
1"				

Agent B Status Information 440

A	B	C	Consensus
442	444	446	448
New	New	New	New
542	544	546	548
Dispatching	Dispatching	Dispatching	Dispatching
432	544	546	548'
New	Dispatching	Dispatching	Dispatching
542"	544	546	548"
	Dispatching	Dispatching	Dispatching

Agent C Status Information 450

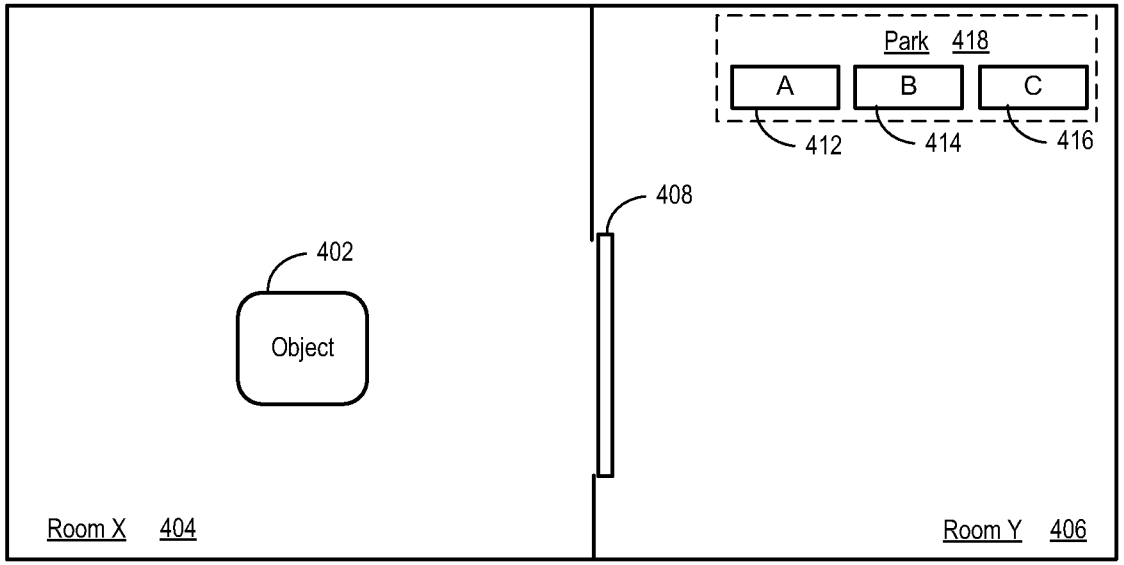
A	B	C	Consensus
452	454	456	458
New	New	New	New
552	554	556	558
Dispatching	Dispatching	Dispatching	Dispatching
432	554	556	558'
New	Dispatching	Dispatching	Dispatching
552"	554	556	558"
	Dispatching	Dispatching	Dispatching

FIG. 5

T=2

Agent C Ready

Agents A, B Still Dispatching



Agent A Status Information 430

Time	A	B	C	Consensus
0 (422)	New (432)	New (434)	New (436)	New (438)
1 (522)	Dispatching (532)	Dispatching (534)	Dispatching (536)	Dispatching (538)
2 (622)	Dispatching (532)	Dispatching (534)	Ready (636)	Dispatching (538)

Agent B Status Information 440

A	B	C	Consensus
New (442)	New (444)	New (446)	New (448)
Dispatching (542)	Dispatching (544)	Dispatching (546)	Dispatching (548)
Dispatching (542)	Dispatching (544)	Ready (646)	Dispatching (548)

Agent C Status Information 450

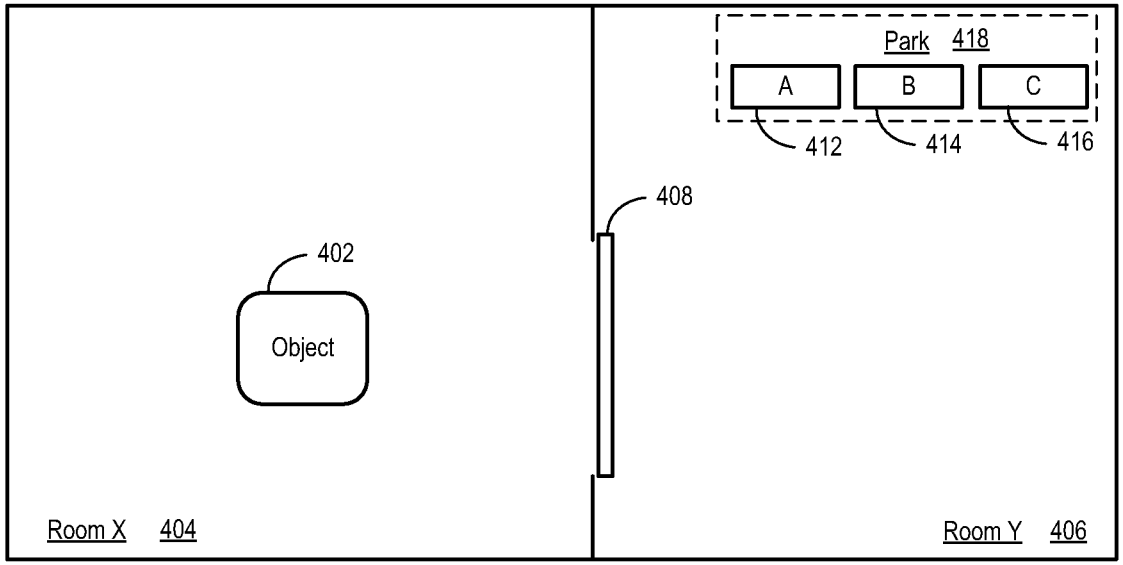
A	B	C	Consensus
New (452)	New (454)	New (456)	New (458)
Dispatching (552)	Dispatching (554)	Dispatching (556)	Dispatching (558)
Dispatching (552)	Dispatching (554)	Ready (656)	Dispatching (558)

FIG. 6

T=3

Agents A and B Ready

Agent C Has Not Received a Status Message Carrying Agent A Status Information



Agent A Status Information 430

Time	A	B	C	Consensus
0	New	New	New	New
1	Dispatching	Dispatching	Dispatching	Dispatching
2	Dispatching	Dispatching	Ready	Dispatching
3	Ready	Ready	Ready	Ready

Agent B Status Information 440

A	B	C	Consensus
New	New	New	New
Dispatching	Dispatching	Dispatching	Dispatching
Dispatching	Dispatching	Ready	Dispatching
Ready	Ready	Ready	Ready

Agent C Status Information 450

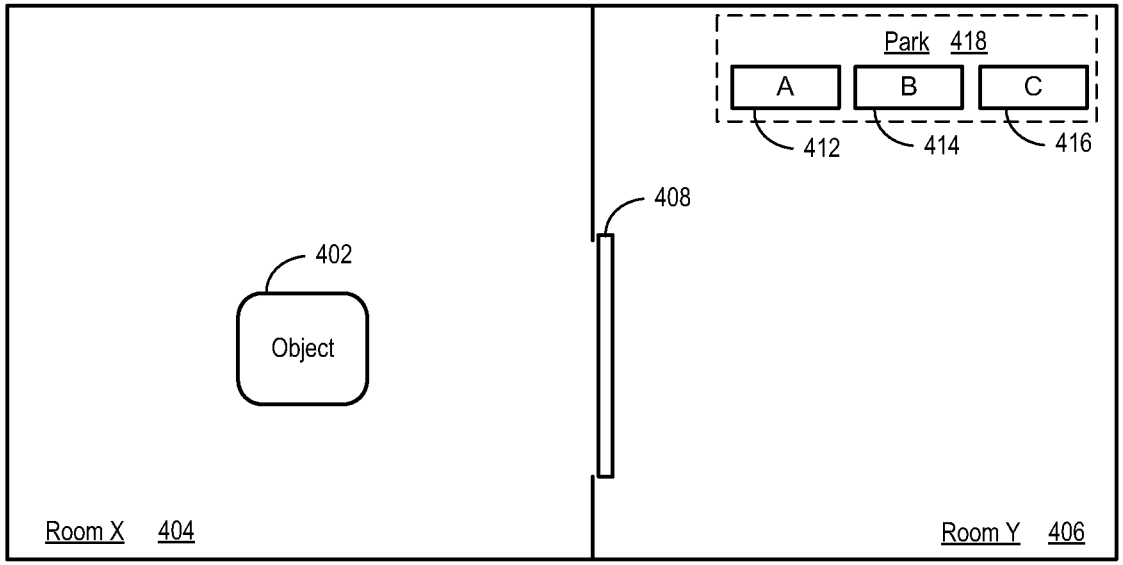
A	B	C	Consensus
New	New	New	New
Dispatching	Dispatching	Dispatching	Dispatching
Dispatching	Dispatching	Ready	Dispatching
Dispatching	Ready	Ready	Dispatching

FIG. 7

T=4

Agents A, B, C Ready

Agent C Receives a Status Message Carrying Updated Agent A Status Information



Agent A Status Information 430

Time	A	B	C	Consensus
0	New	New	New	New
1	Dispatching	Dispatching	Dispatching	Dispatching
2	Dispatching	Dispatching	Ready	Dispatching
3	Ready	Ready	Ready	Ready
4	Ready	Ready	Ready	Ready

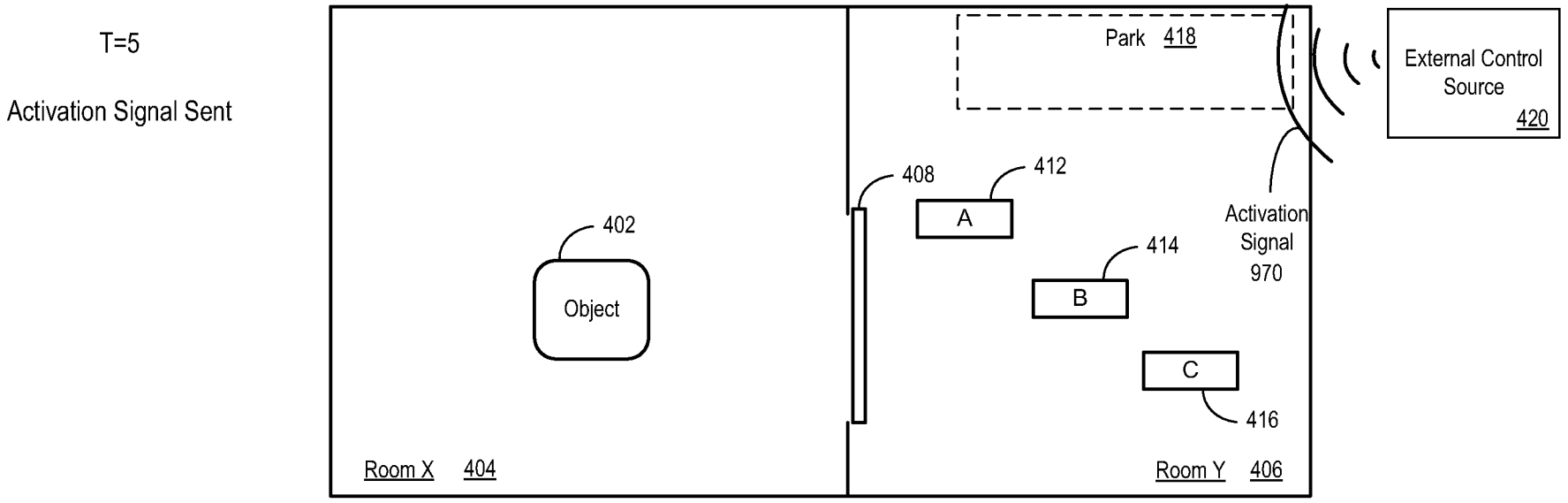
Agent B Status Information 440

A	B	C	Consensus
New	New	New	New
Dispatching	Dispatching	Dispatching	Dispatching
Dispatching	Dispatching	Ready	Dispatching
Ready	Ready	Ready	Ready
Ready	Ready	Ready	Ready

Agent C Status Information 450

A	B	C	Consensus
New	New	New	New
Dispatching	Dispatching	Dispatching	Dispatching
Dispatching	Dispatching	Ready	Dispatching
Dispatching	Ready	Ready	Dispatching
Ready	Ready	Ready	Ready

FIG. 8



Agent A Status Information 430

Time	A	B	C	Consensus
922	932	934	936	938
5	Active	Active	Active	Active

Agent B Status Information 440

A	B	C	Consensus
942	944	946	948
Active	Active	Active	Active

Agent C Status Information 450

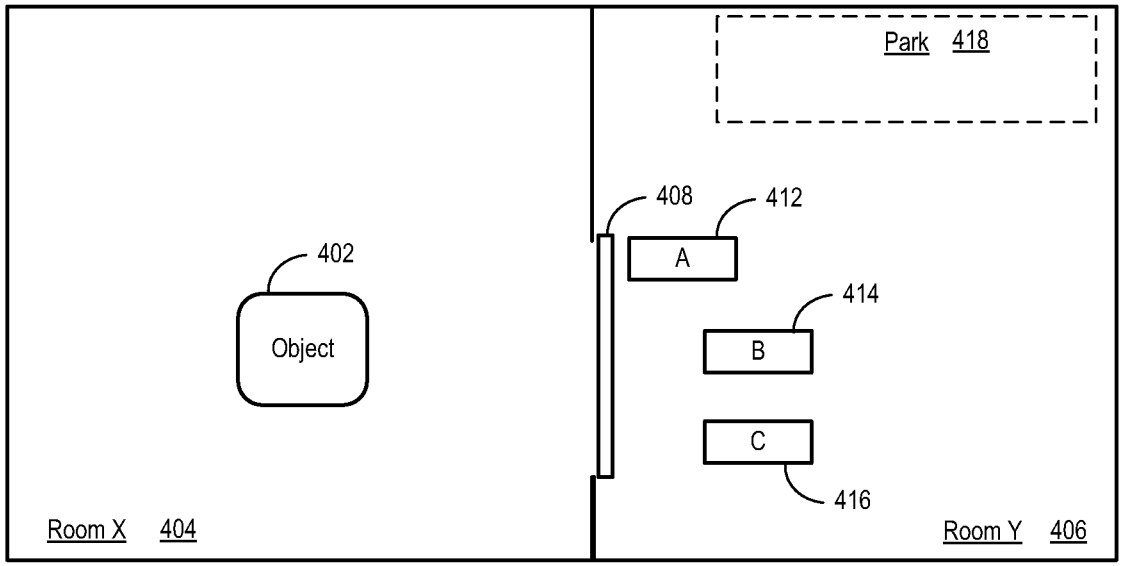
A	B	C	Consensus
952	954	956	958
Active	Active	Active	Active

FIG. 9

T=6

Agent A Completes Role in Task

Agents B and C Still Executing Role in Task



Agent A Status Information 430

Time	A	B	C	Consensus
922	932	934	936	938
5	Active	Active	Active	Active
1022	1032	934	936	938
6	Complete	Active	Active	Active

Agent B Status Information 440

A	B	C	Consensus
942	944	946	948
Active	Active	Active	Active
1042	944	946	948
Complete	Active	Active	Active

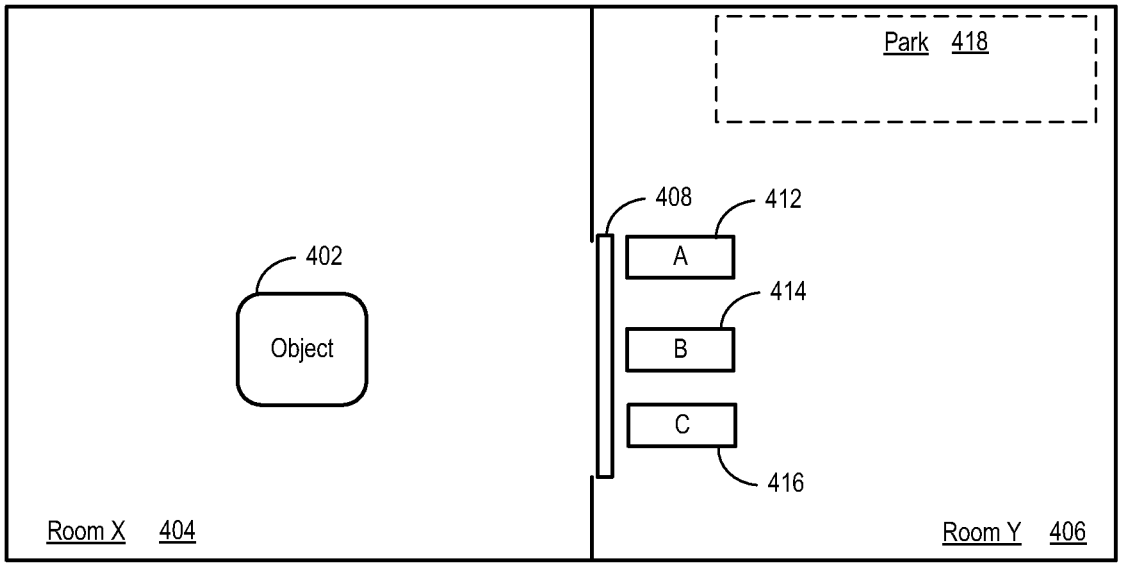
Agent C Status Information 450

A	B	C	Consensus
952	954	956	958
Active	Active	Active	Active
1052	954	956	958
Complete	Active	Active	Active

FIG. 10

T=7

Agents A, B, and C Complete Roles in Task



Agent A Status Information 430

Time	A	B	C	Consensus
5	Active	Active	Active	Active
6	Complete	Active	Active	Active
7	Complete	Complete	Complete	Complete

Agent B Status Information 440

A	B	C	Consensus
Active	Active	Active	Active
Complete	Active	Active	Active
Complete	Complete	Complete	Complete

Agent C Status Information 450

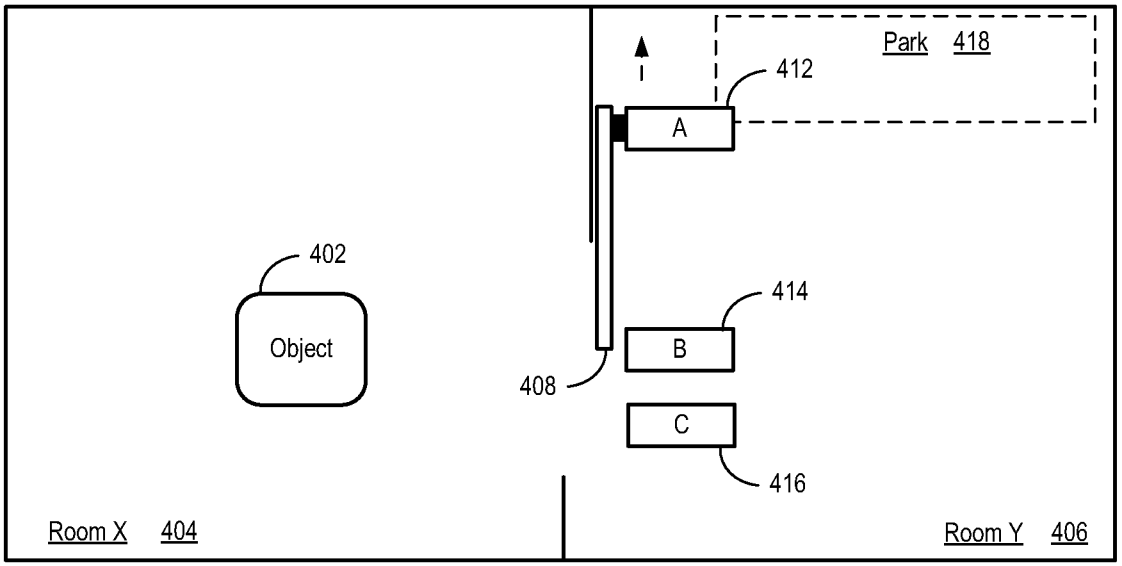
A	B	C	Consensus
Active	Active	Active	Active
Complete	Active	Active	Active
Complete	Complete	Complete	Complete

FIG. 11

T=8

Agent A Performs Unshared Task

Agents B and C Subscribe to Status of Agent A



Agent A Status Information 430

Time	A	B	C	Consensus
1222	1232	1234	1236	1238
8	Active			Active

Agent B Status Information 440

A	B	C	Consensus
1242	1244	1246	1248
Active			Active

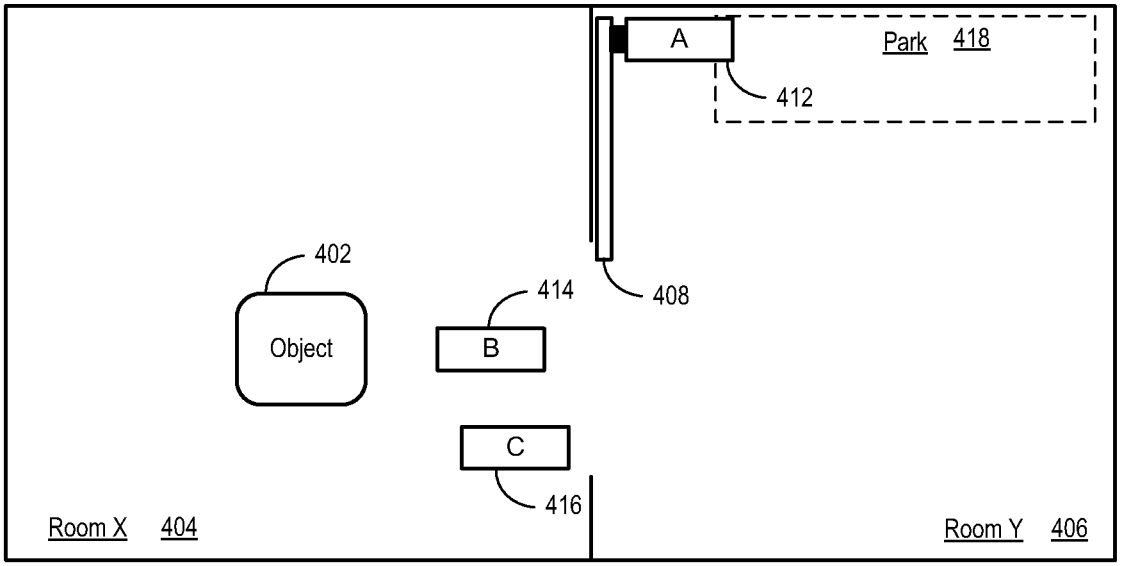
Agent C Status Information 450

A	B	C	Consensus
1252	1254	1256	1258
Active			Active

FIG. 12

T=9
Agent A Completes Task

Agents B and C Begin Next Task Dependent on Completion of Preceding Task



Agent A Status Information 430

Time	A	B	C	Consensus
8 (1232)	Active (1232)	(1234)	(1236)	Active (1238)
9 (1322)	(1332)	Active (1334)	Active (1336)	Active (1338)

Agent B Status Information 440

A	B	C	Consensus
Active (1242)	(1244)	(1246)	Active (1248)
(1342)	Active (1344)	Active (1346)	Active (1348)

Agent C Status Information 450

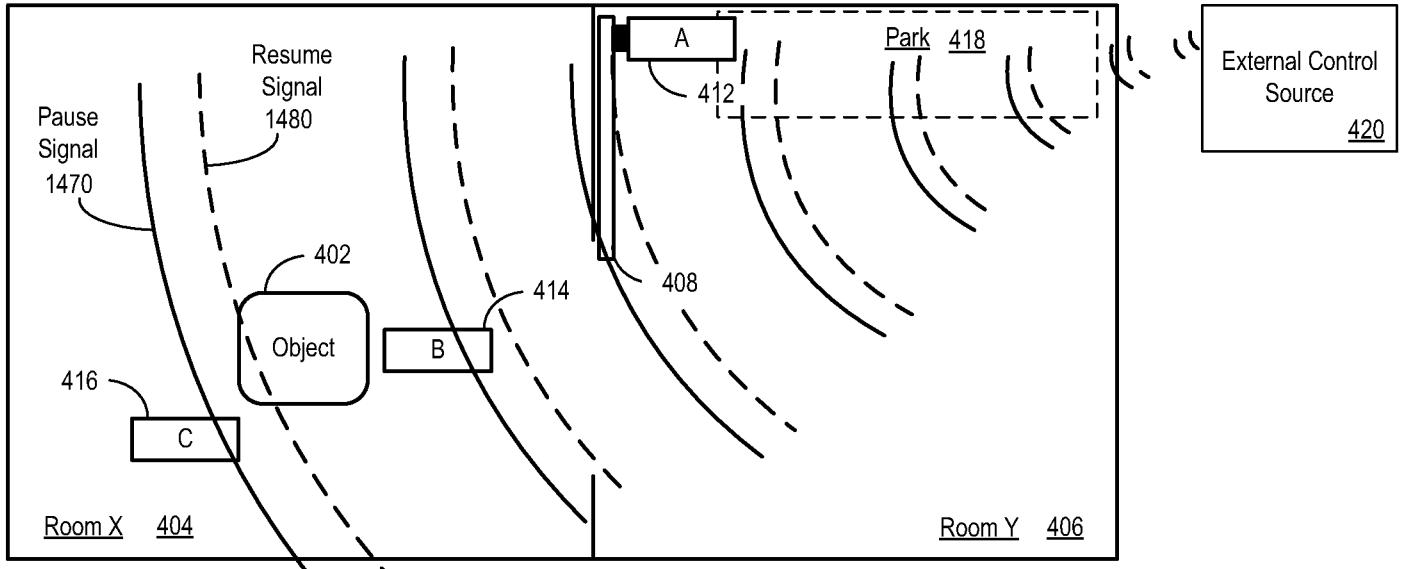
A	B	C	Consensus
Active (1252)	(1254)	(1256)	Active (1258)
(1352)	Active (1354)	Active (1356)	Active (1358)

FIG. 13

T=10
Agent B Completes Task

T=11
Task Paused by Third Party

T=12
Task Resumed by Third Party



Agent A Status Information 430

	A	B	C	Consensus
1422		1332	1434	1336	1338
10		Complete	Active	Active
1423		1332	1434	1436	1338
11		Complete	Paused	Active
1425		1332	1434	1437	1338
12		Complete	Active	Active

Agent B Status Information 440

	A	B	C	Consensus
1342		1444	1346	1348
		Complete	Active	Active
1342		1344	1446	1348
		Complete	Paused	Active
1342		1344	1447	1348
		Complete	Active	Active

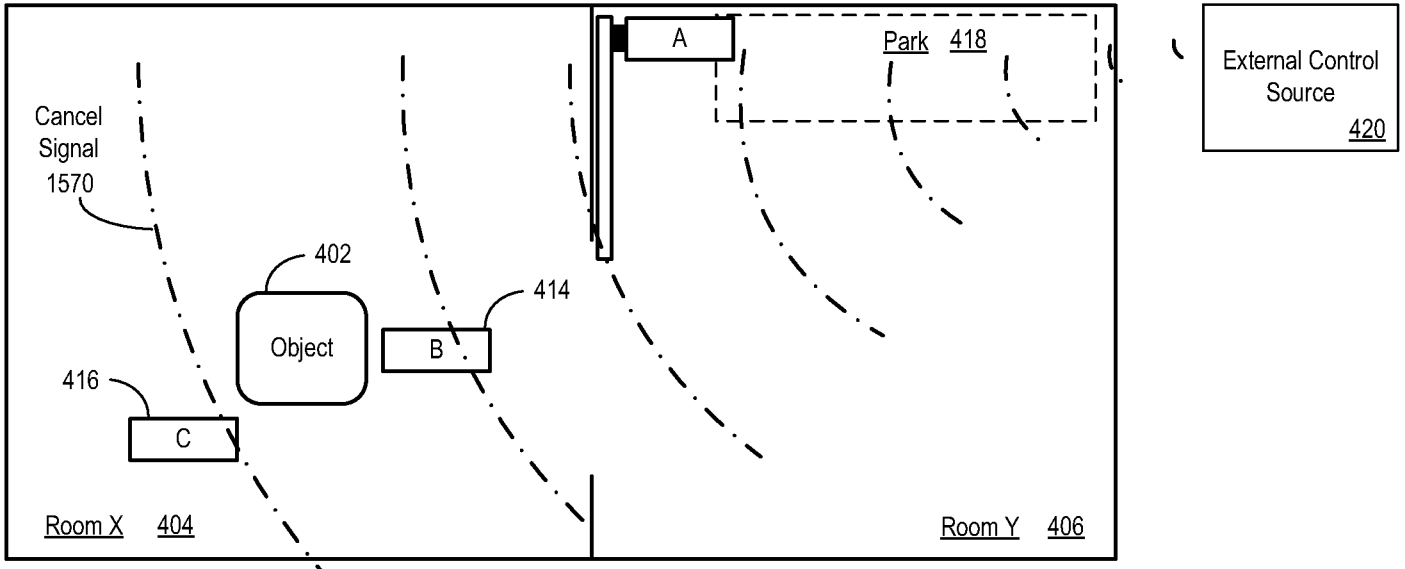
Agent C Status Information 450

	A	B	C	Consensus
1352		1454	1356	1358
		Complete	Active	Active
1352		1454	1456	1358
		Complete	Paused	Active
1352		1354	1457	1358
		Complete	Active	Active

FIG. 14

T=13

Task Canceled by External Control Source



Agent A Status Information 430

1522	A	1532	B	1534	C	1536	Consensus	1538
13		Cancel		Cancel		Cancel		Cancel

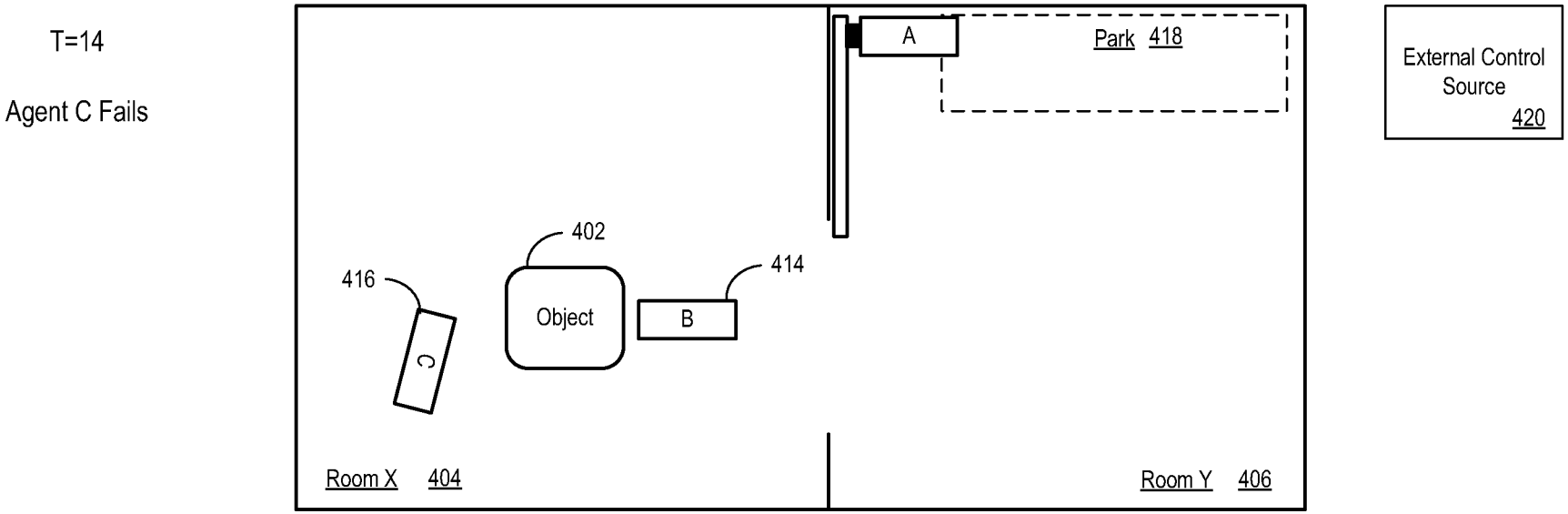
Agent B Status Information 440

A	1542	B	1544	C	1546	Consensus	1548
	Cancel		Cancel		Cancel		Cancel

Agent C Status Information 450

A	1552	B	1554	C	1556	Consensus	1558
	Cancel		Cancel		Cancel		Cancel

FIG. 15



Agent A Status Information 430

1622	A 1632	B 1634	C 1636	Consensus 1638
14	Failed	Failed	Failed	Failed

Agent B Status Information 440

A 1642	B 1644	C 1646	Consensus 1648
Failed	Failed	Failed	Failed

Agent C Status Information 450

A 1652	B 1654	C 1656	Consensus 1658
Failed	Failed	Failed	Failed

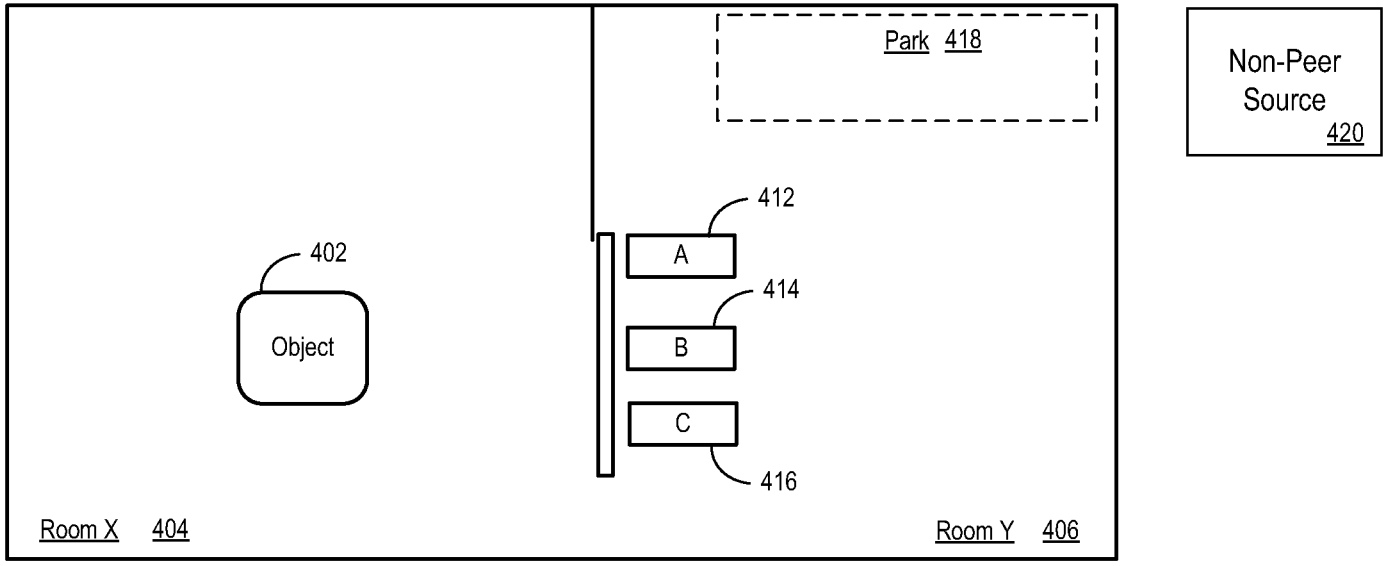
FIG. 16

T=7'

All Complete, Agent A receives update from Agent C but not Agent B; Agent C had previous update from Agent A but receives no update from Agent B; Agent B does not receive update from Agent C

T=7"

Agent C Receives Conflicting Status Information from Agent A and Agent B Sent at T=7'



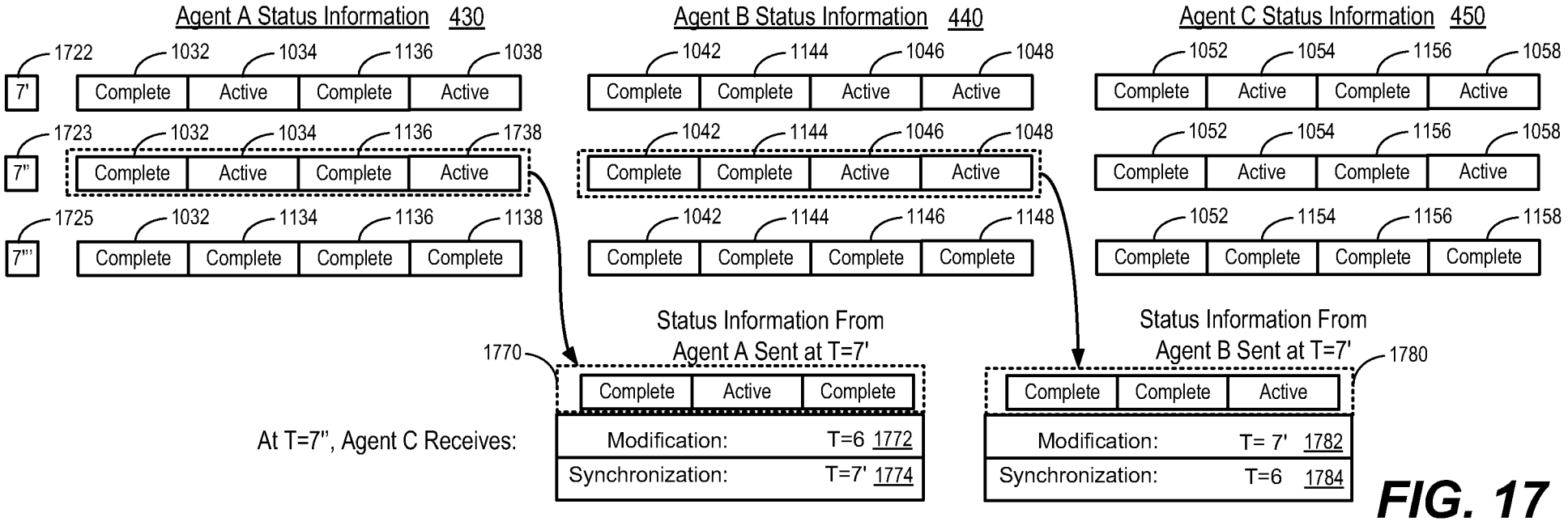


FIG. 17

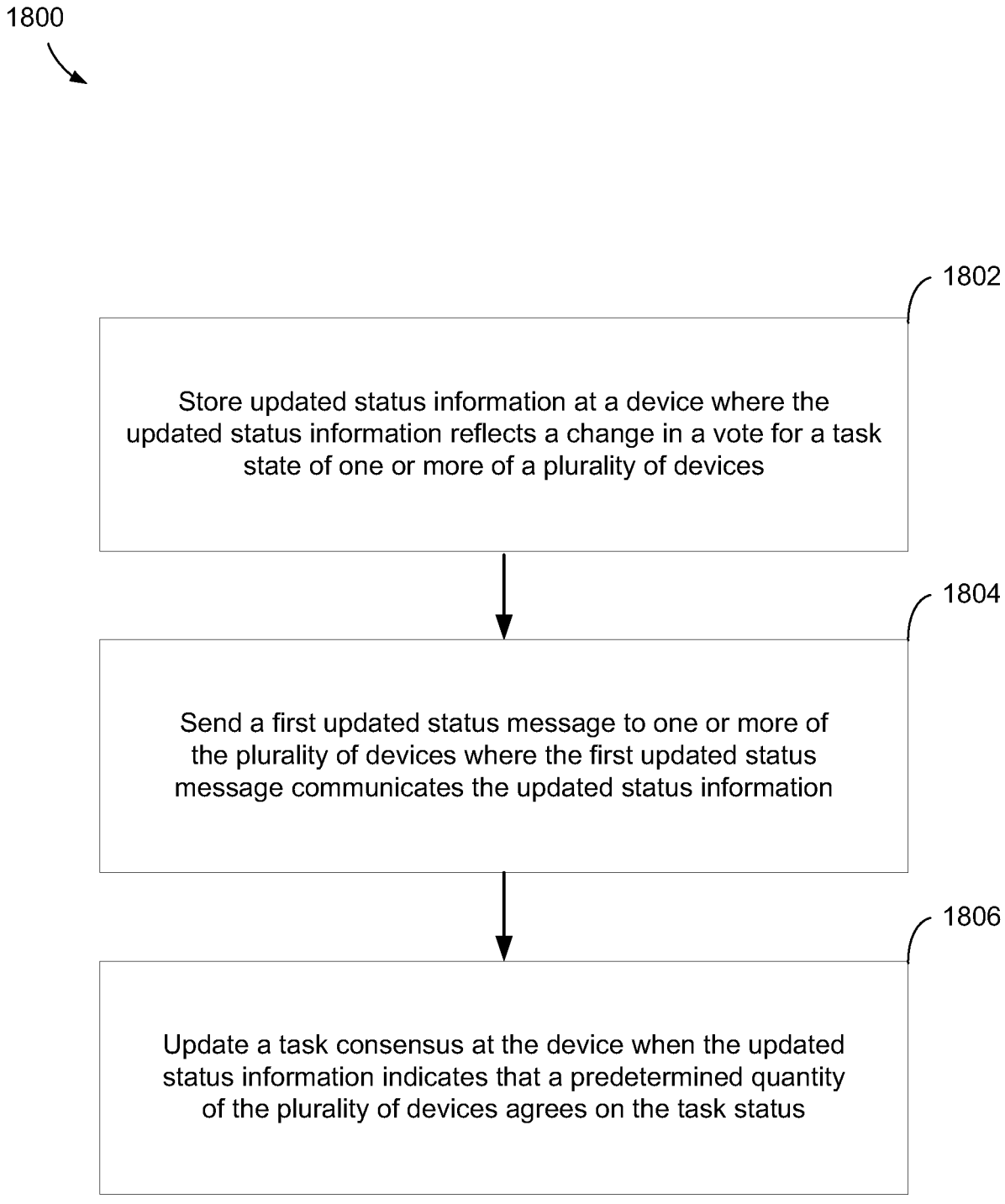

1800
1802
Store updated status information at a device where the updated status information reflects a change in a vote for a task state of one or more of a plurality of devices
1804
Send a first updated status message to one or more of the plurality of devices where the first updated status message communicates the updated status information
1806
Update a task consensus at the device when the updated status information indicates that a predetermined quantity of the plurality of devices agrees on the task status

FIG. 18

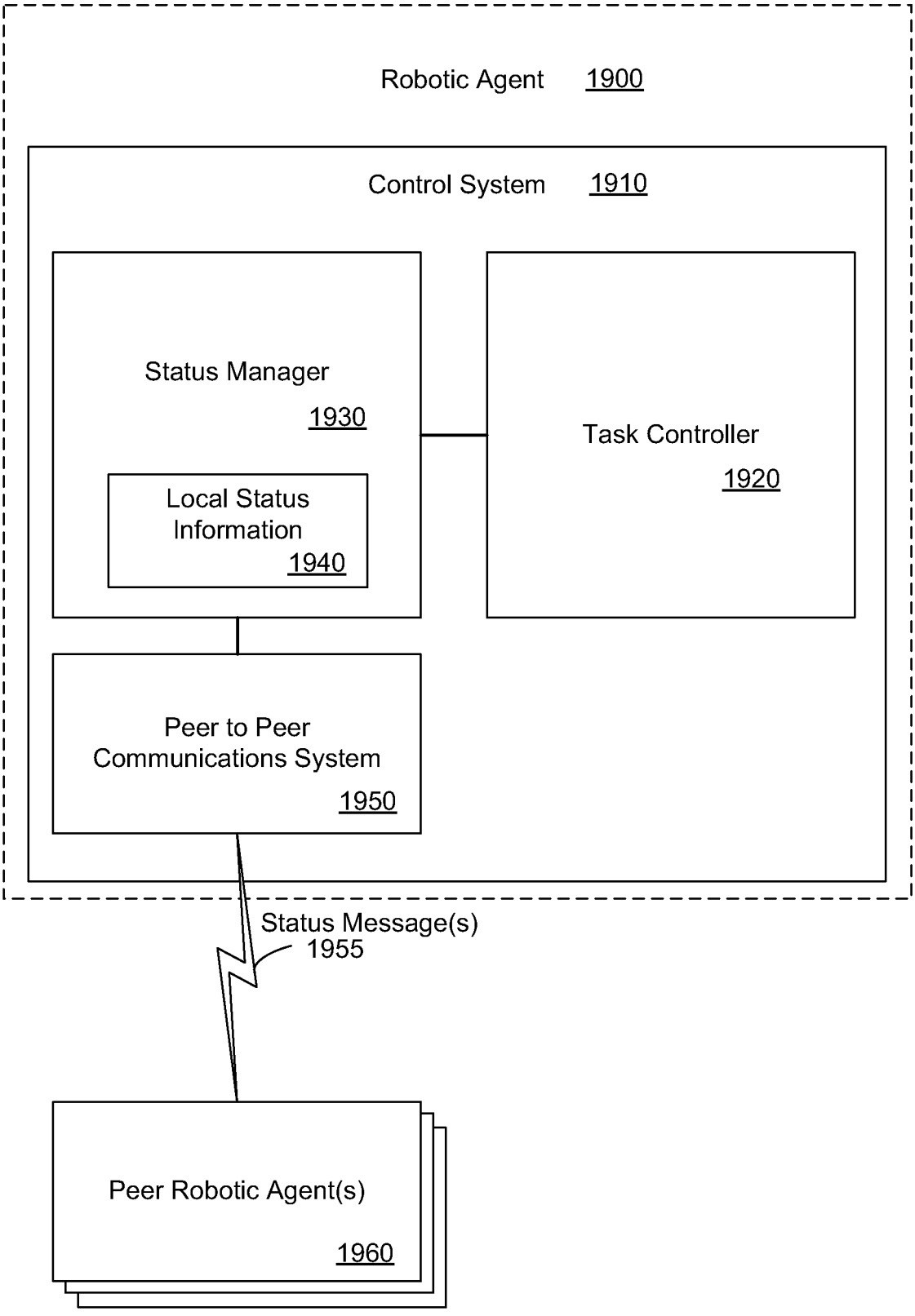

Robotic Agent 1900
Control System 1910
Status Manager
1930
Local Status Information
1940
Task Controller
1920
Peer to Peer Communications System
1950
Status Message(s)
1955
Peer Robotic Agent(s)
1960

FIG. 19

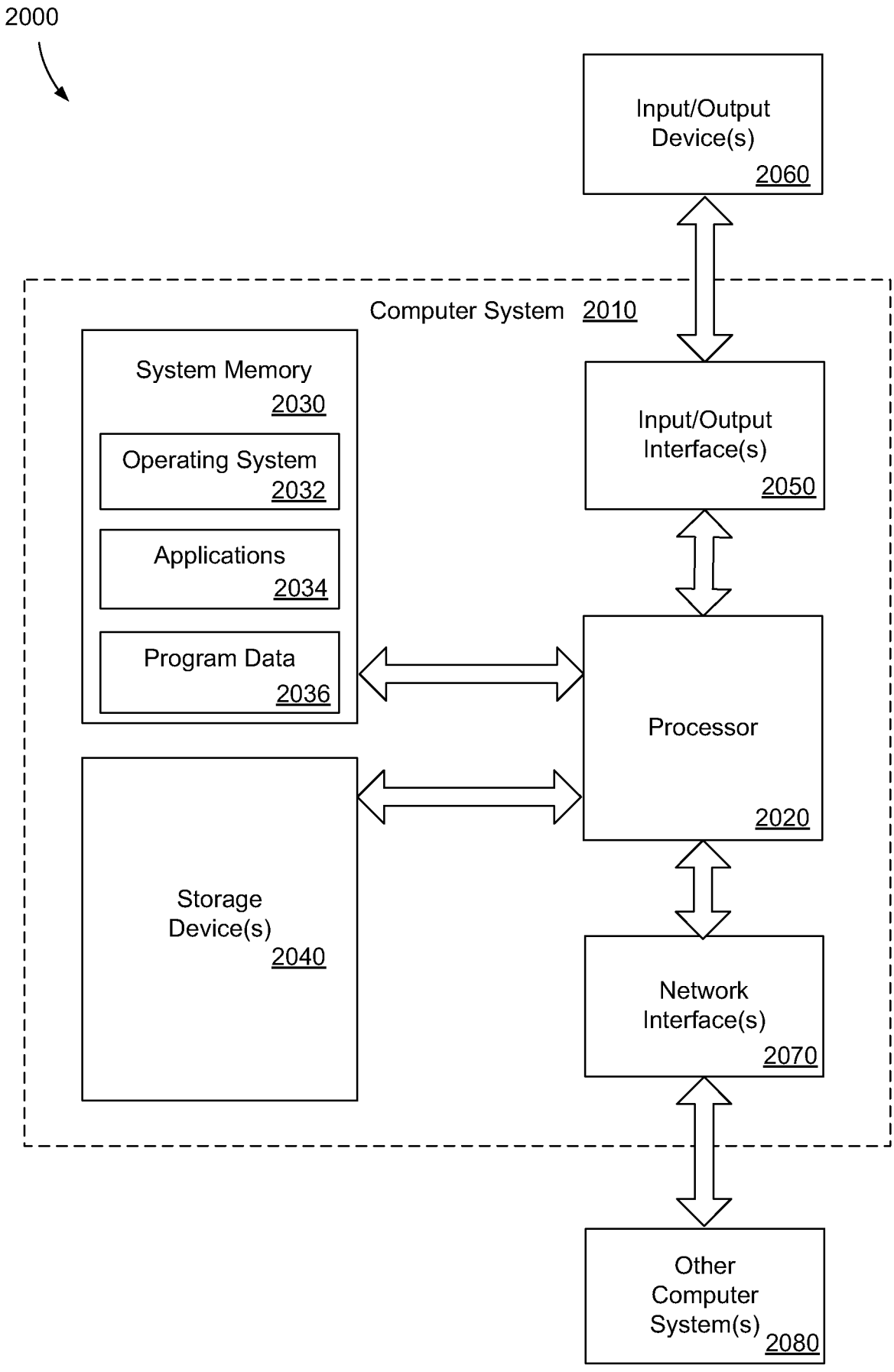

2000
Input/Output Device(s) 2060
Computer System 2010
System Memory 2030
Operating System 2032
Applications 2034
Program Data 2036
Input/Output Interface(s) 2050
Processor 2020
Storage Device(s) 2040
Network Interface(s) 2070
Other Computer System(s) 2080

FIG. 20