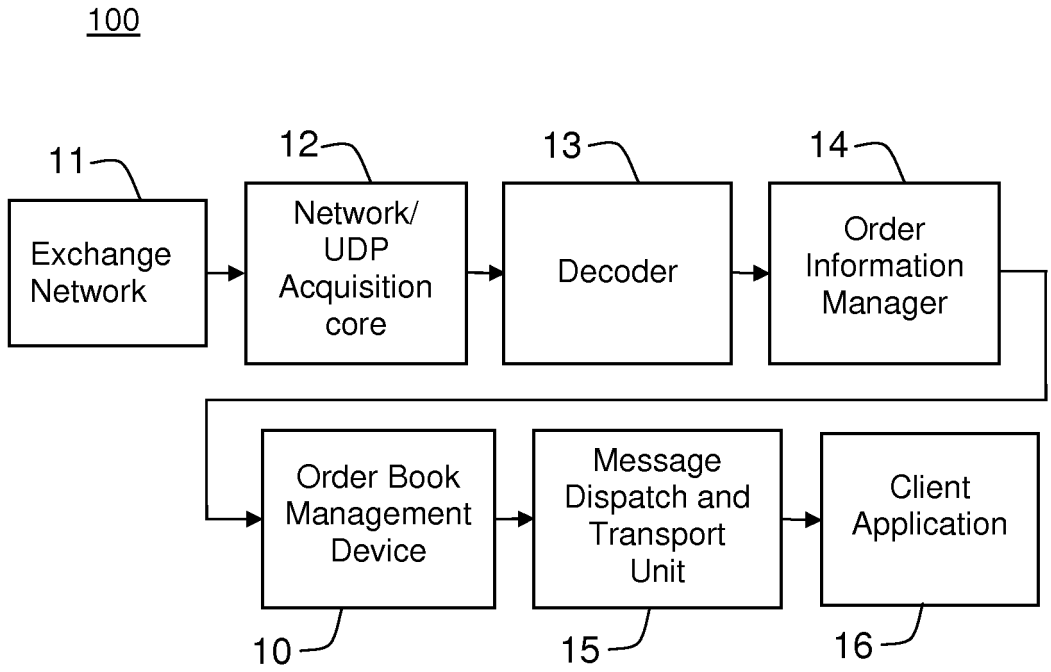

100
11
Exchange Network
12
Network/ UDP Acquisition core
13
Decoder
14
Order Information Manager
Order Book Management Device
10
Message Dispatch and Transport Unit
15
Client Application
16

FIG.1

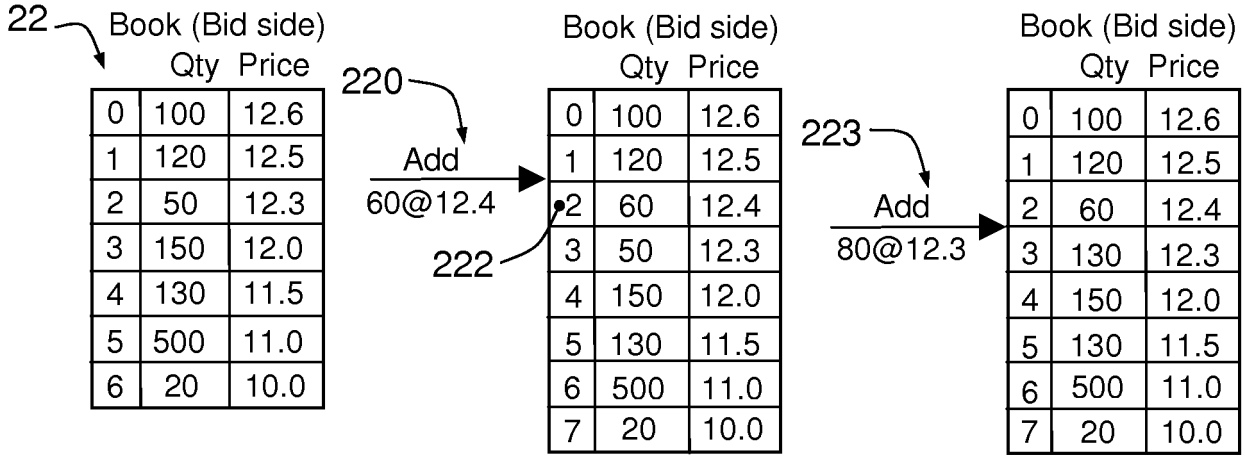

22
Book (Bid side)
Qty Price
0 100 12.6
1 120 12.5
2 50 12.3
3 150 12.0
4 130 11.5
5 500 11.0
6 20 10.0
220
Add
60@12.4
222
Book (Bid side)
Qty Price
0 100 12.6
1 120 12.5
2 60 12.4
3 50 12.3
4 150 12.0
5 130 11.5
6 500 11.0
7 20 10.0
223
Add
80@12.3
Book (Bid side)
Qty Price
0 100 12.6
1 120 12.5
2 60 12.4
3 130 12.3
4 150 12.0
5 130 11.5
6 500 11.0
7 20 10.0

FIG.2

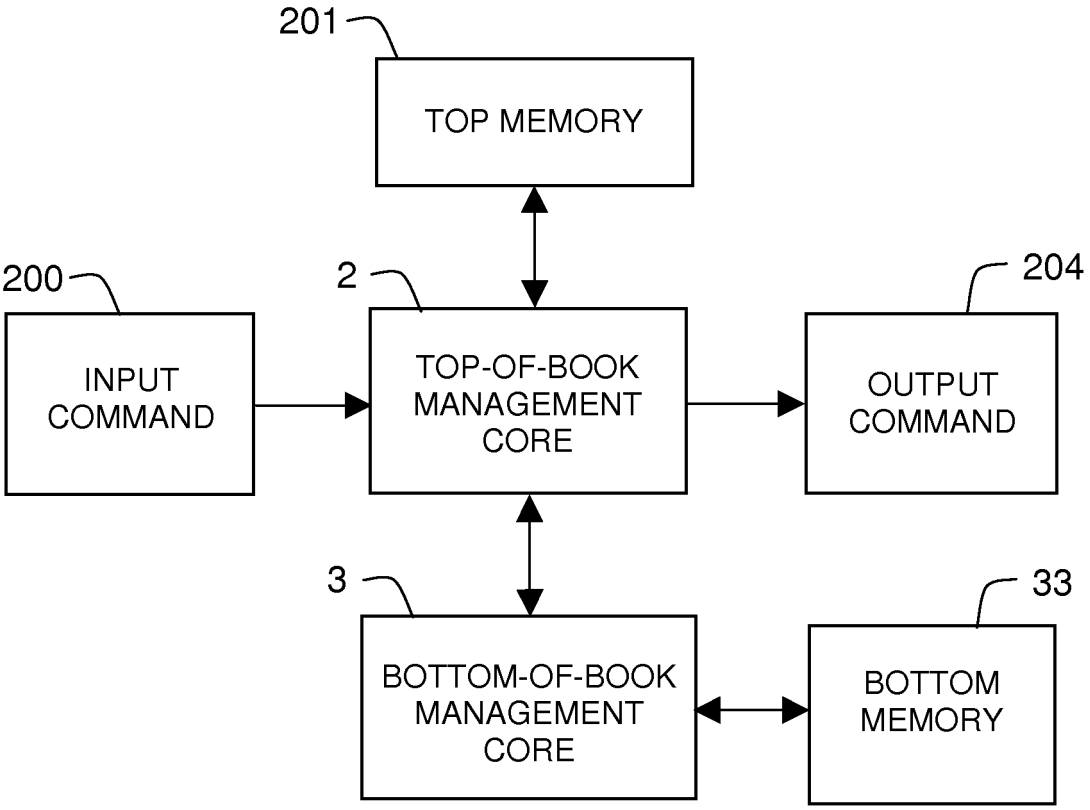

201
TOP MEMORY
200
INPUT COMMAND
2
TOP-OF-BOOK MANAGEMENT CORE
204
OUTPUT COMMAND
3
BOTTOM-OF-BOOK MANAGEMENT CORE
33
BOTTOM MEMORY

FIG.3

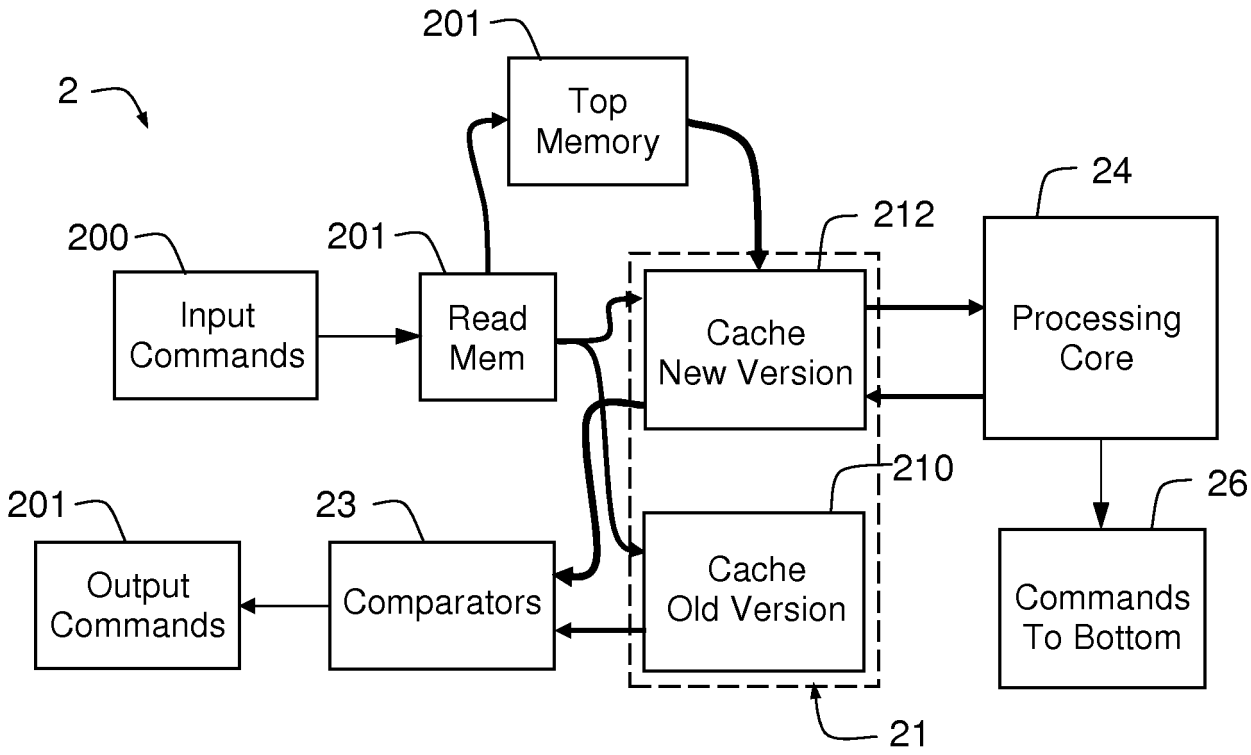

201
Top Memory
2
200
Input Commands
201
Read Mem
212
Cache New Version
24
Processing Core
210
Cache Old Version
26
Commands To Bottom
201
Output Commands
23
Comparators
21

FIG.4

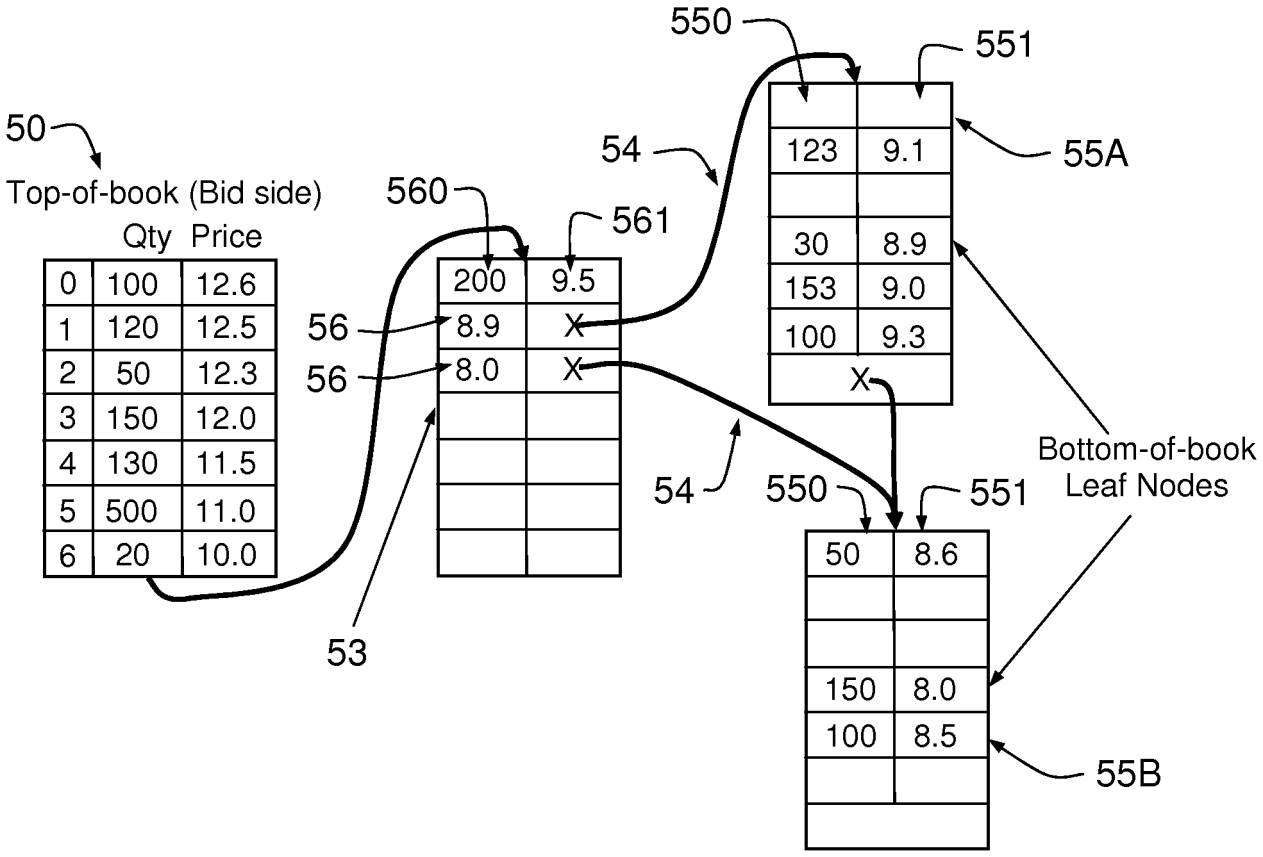

50
Top-of-book (Bid side)
Qty Price
0 100 12.6
1 120 12.5
2 50 12.3
3 150 12.0
4 130 11.5
5 500 11.0
6 20 10.0
560
561
200 9.5
56
8.9
56
8.0
53
54
550
551
123 9.1
55A
30 8.9
153 9.0
100 9.3
54
550
551
Bottom-of-book
Leaf Nodes
50 8.6
150 8.0
100 8.5
55B

FIG.5

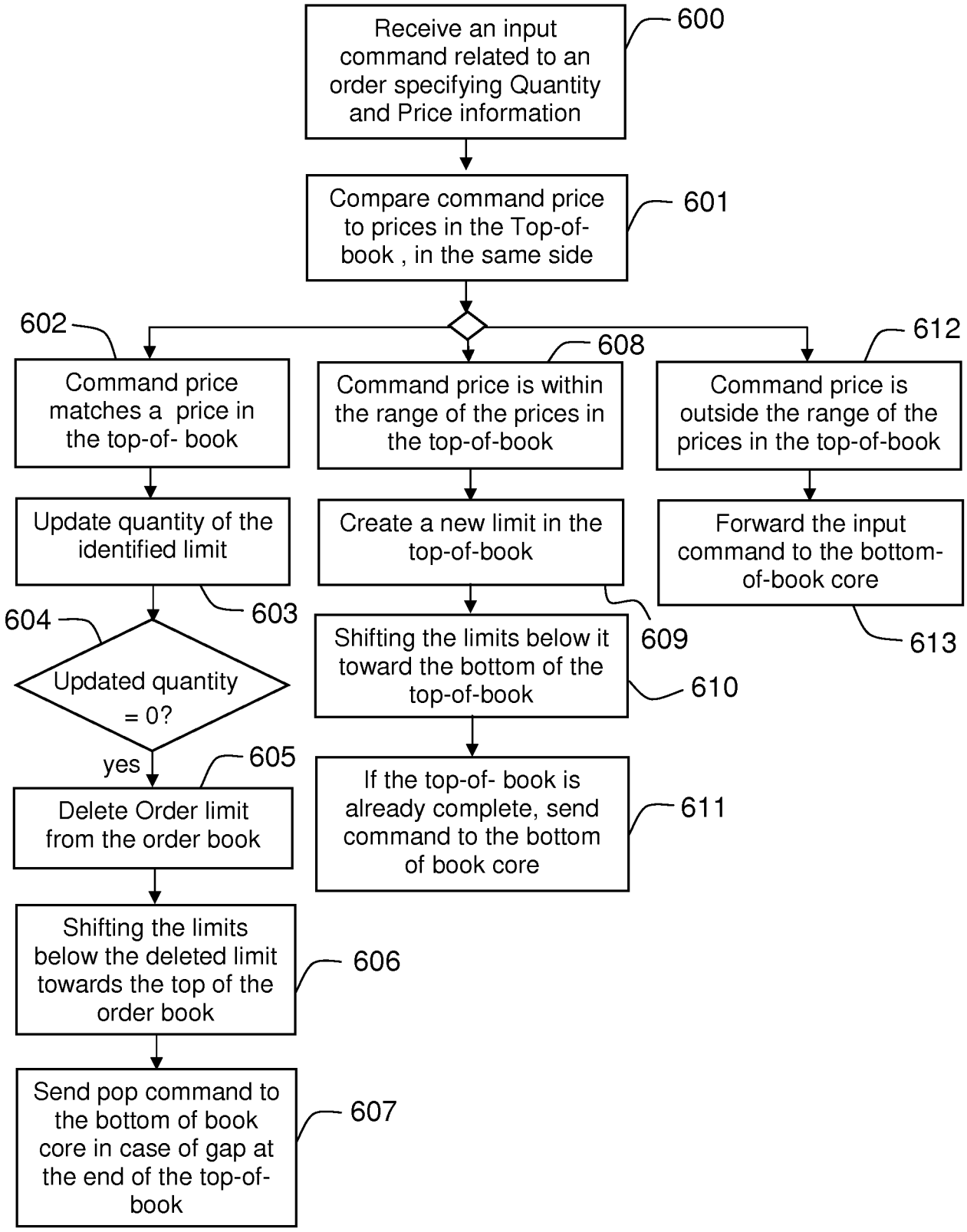

Receive an input command related to an order specifying Quantity and Price information
600
Compare command price to prices in the Top-of-book , in the same side
601
602
Command price matches a price in the top-of- book
608
Command price is within the range of the prices in the top-of-book
612
Command price is outside the range of the prices in the top-of-book
Update quantity of the identified limit
603
Create a new limit in the top-of-book
609
Forward the input command to the bottom-of-book core
613
604
Updated quantity = 0?
yes
605
Shifting the limits below it toward the bottom of the top-of-book
610
Delete Order limit from the order book
If the top-of- book is already complete, send command to the bottom of book core
611
Shifting the limits below the deleted limit towards the top of the order book
606
Send pop command to the bottom of book core in case of gap at the end of the top-of-book
607

FIG.6

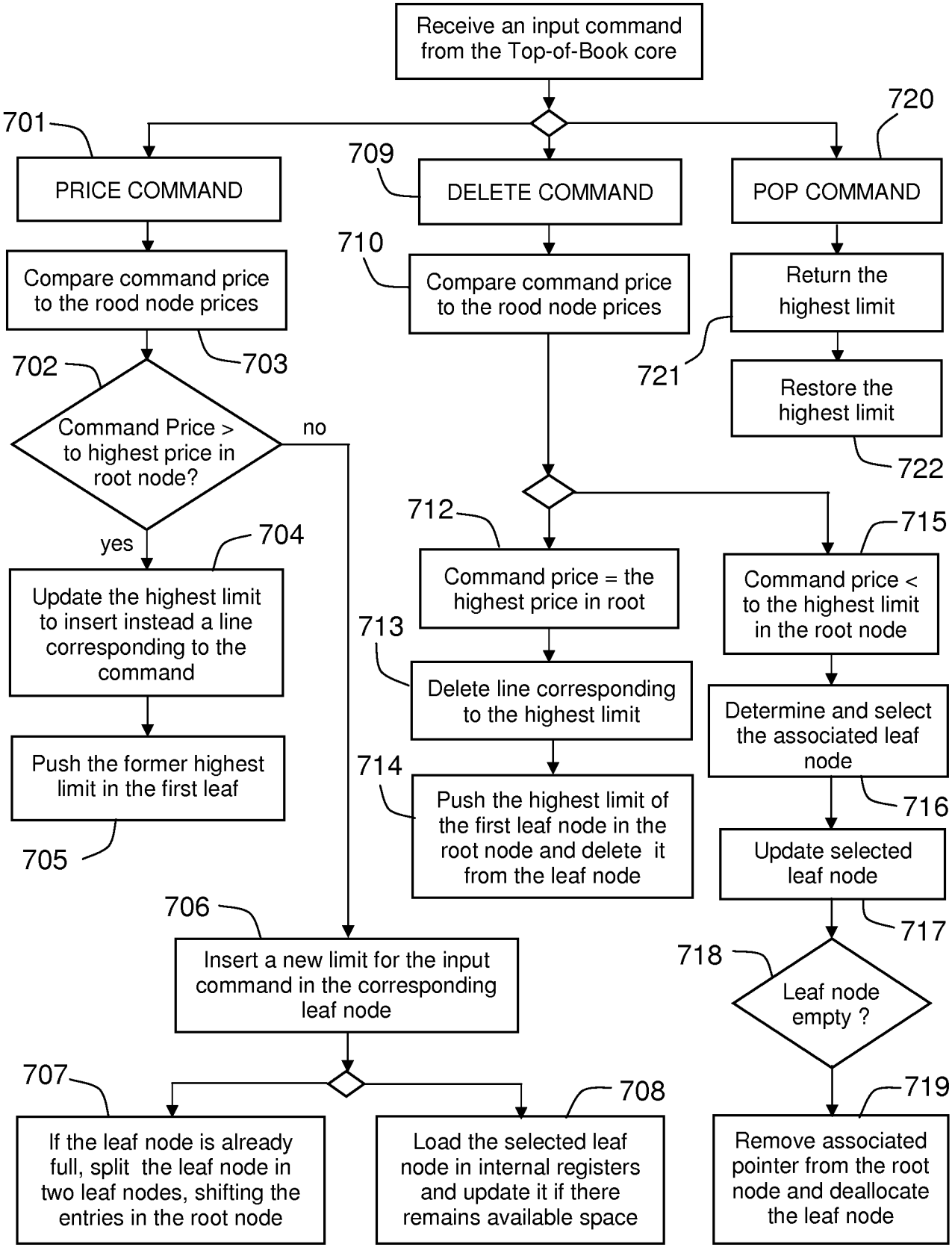

Receive an input command from the Top-of-Book core
701
PRICE COMMAND
Compare command price to the rood node prices
703
702
Command Price > to highest price in root node?
no
yes
704
Update the highest limit to insert instead a line corresponding to the command
Push the former highest limit in the first leaf
705
709
DELETE COMMAND
710
Compare command price to the rood node prices
712
Command price = the highest price in root
713
Delete line corresponding to the highest limit
714
Push the highest limit of the first leaf node in the root node and delete it from the leaf node
720
POP COMMAND
Return the highest limit
721
Restore the highest limit
722
715
Command price < to the highest limit in the root node
Determine and select the associated leaf node
716
Update selected leaf node
717
718
Leaf node empty ?
719
Remove associated pointer from the root node and deallocate the leaf node
706
Insert a new limit for the input command in the corresponding leaf node
707
If the leaf node is already full, split the leaf node in two leaf nodes, shifting the entries in the root node
708
Load the selected leaf node in internal registers and update it if there remains available space

FIG.7

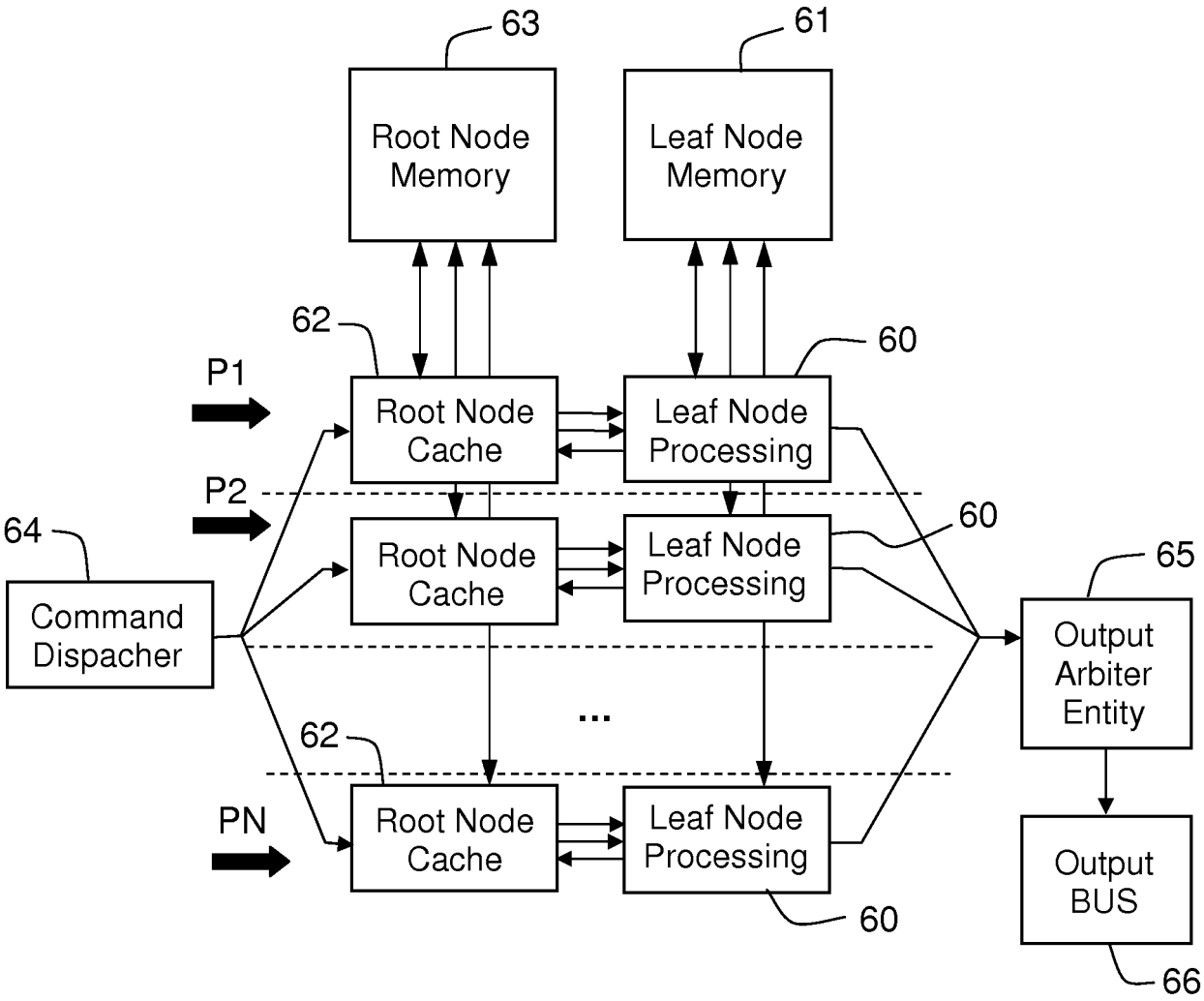

63
61
Root Node Memory
Leaf Node Memory
62
60
P1
Root Node Cache
Leaf Node Processing
P2
64
60
65
Command Dispacher
Root Node Cache
Leaf Node Processing
Output Arbiter Entity
...
62
PN
Root Node Cache
Leaf Node Processing
Output BUS
60
66

FIG.8

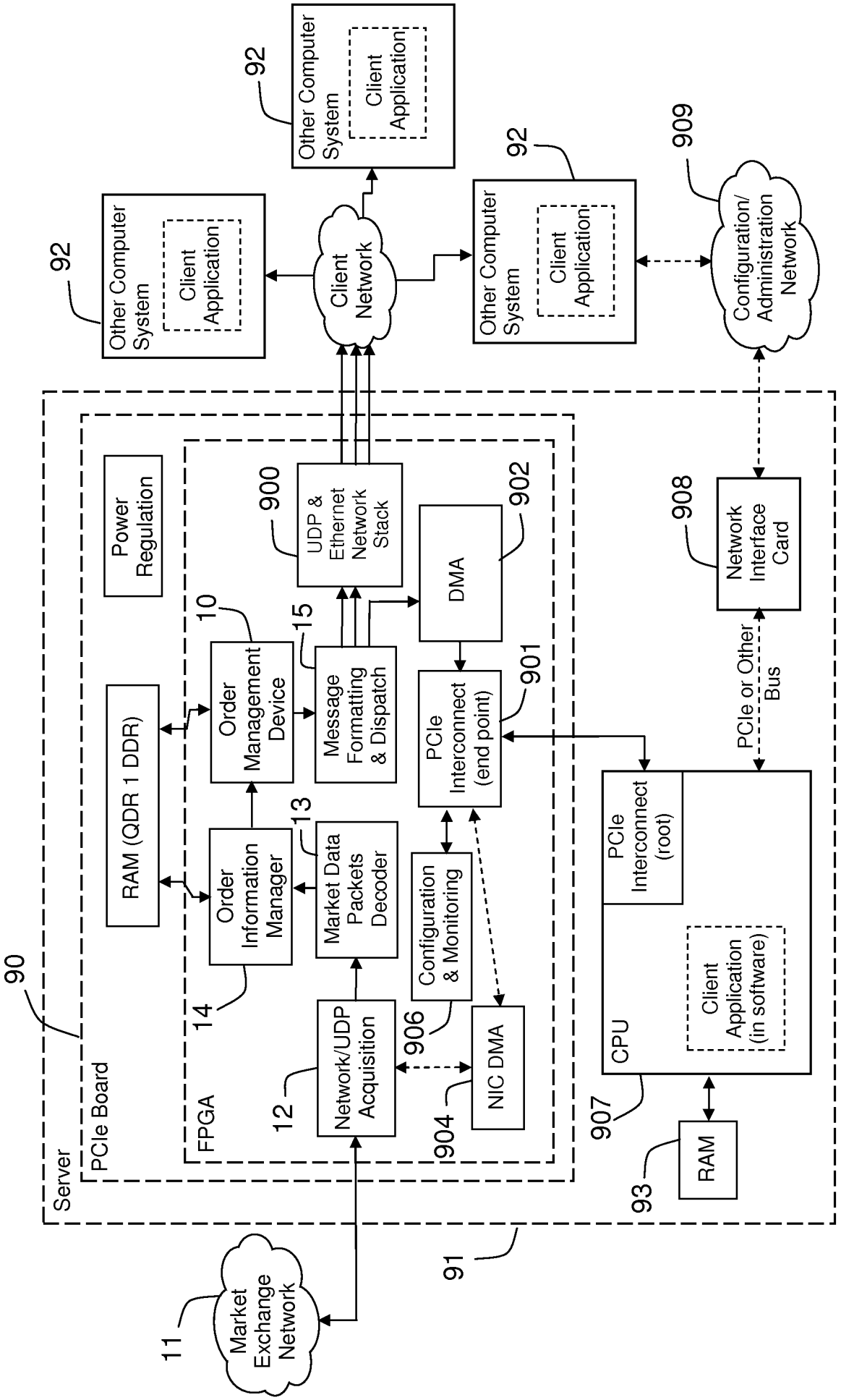

Other Computer System
Client Application
92
Client Network
909
Configuration/ Administration Network
Server
PCIe Board
Power Regulation
FPGA
UDP & Ethernet Network Stack
900
DMA
902
Network Interface Card
908
Order Management Device
10
Message Formatting & Dispatch
15
PCIe Interconnect (end point)
901
PCIe or Other Bus
RAM (QDR 1 DDR)
Order Information Manager
13
Market Data Packets Decoder
Configuration & Monitoring
906
PCIe Interconnect (root)
CPU
Client Application (in software)
907
14
Network/UDP Acquisition
12
NIC DMA
904
RAM
93
Market Exchange Network
11
91
90

FIG.9