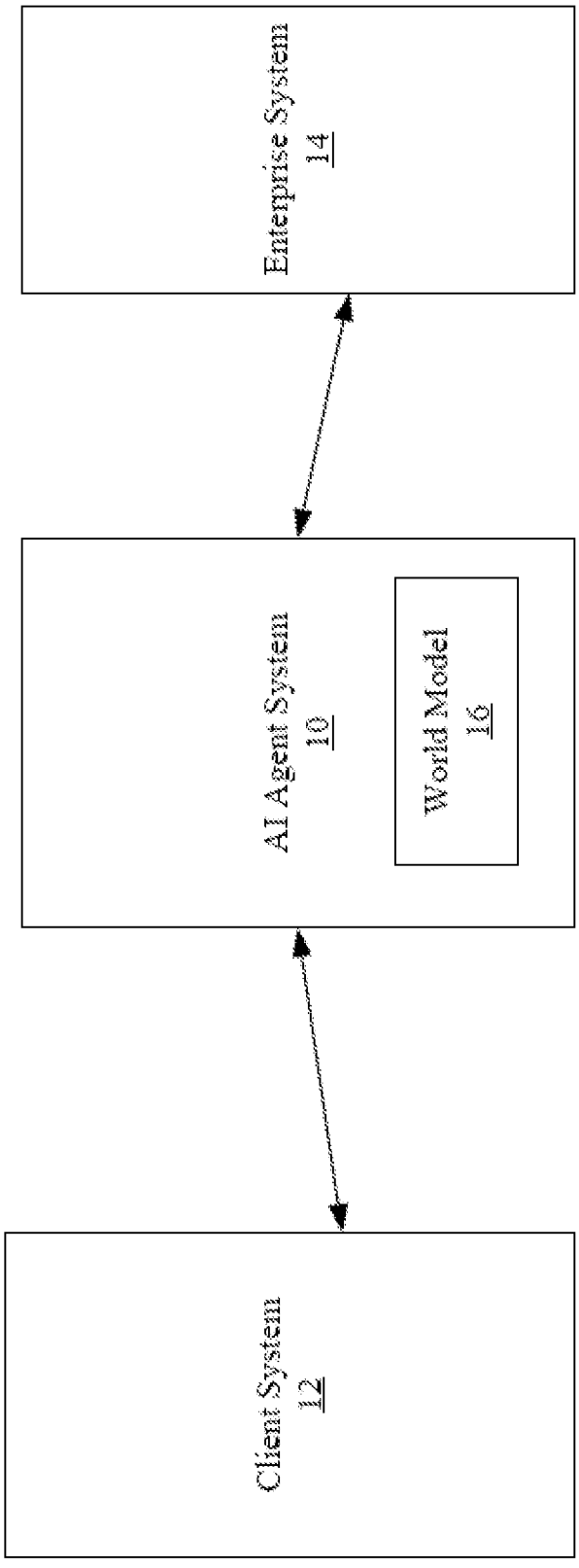
Enterprise System
14
AI Agent System
10
World Model
16
Client System
12

Fig. 1

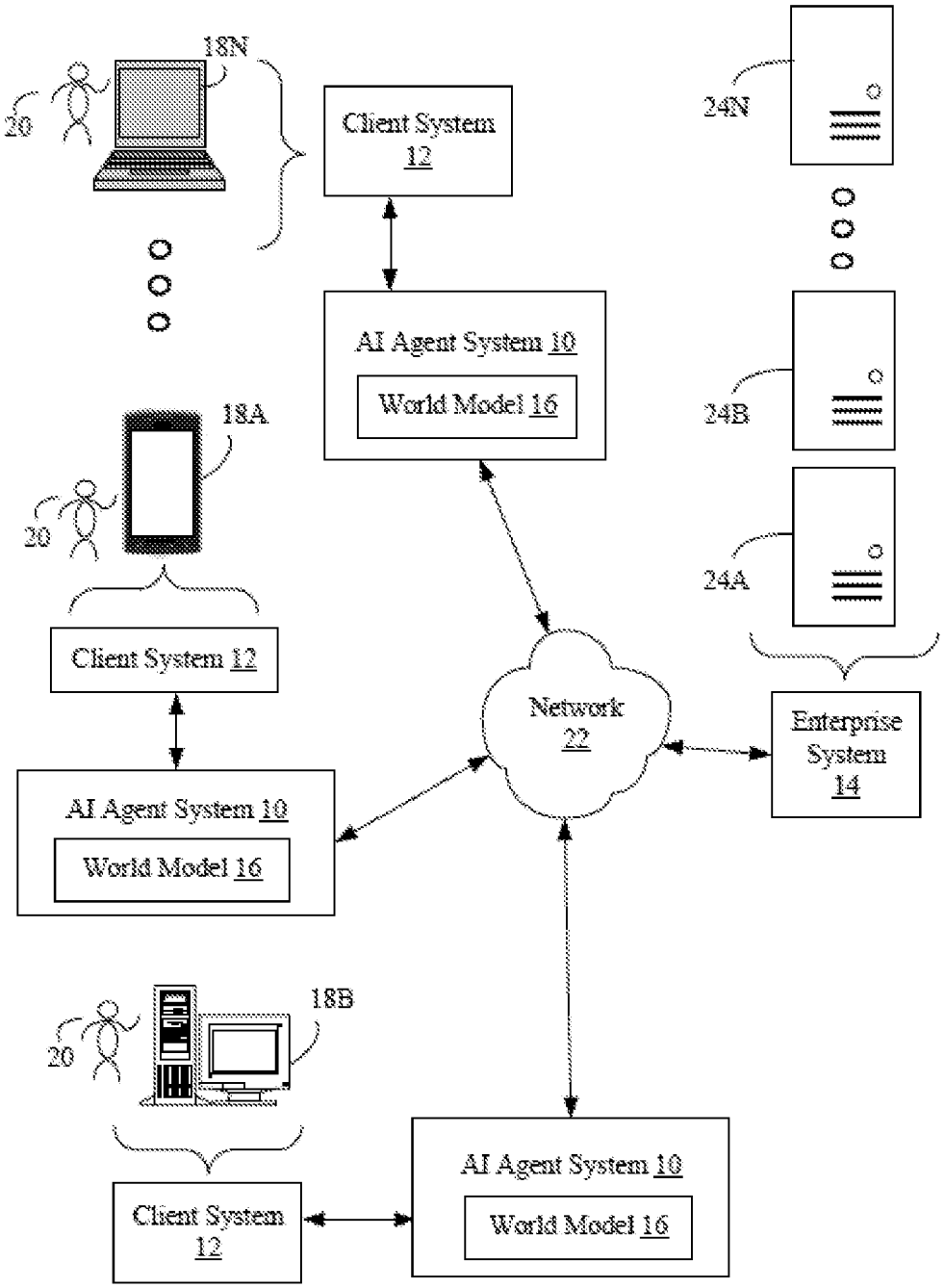
18N
20
Client System 12
24N
AI Agent System 10
World Model 16
24B
18A
20
24A
Client System 12
Network 22
Enterprise System 14
AI Agent System 10
World Model 16
18B
20
AI Agent System 10
World Model 16
Client System 12

Fig. 2A

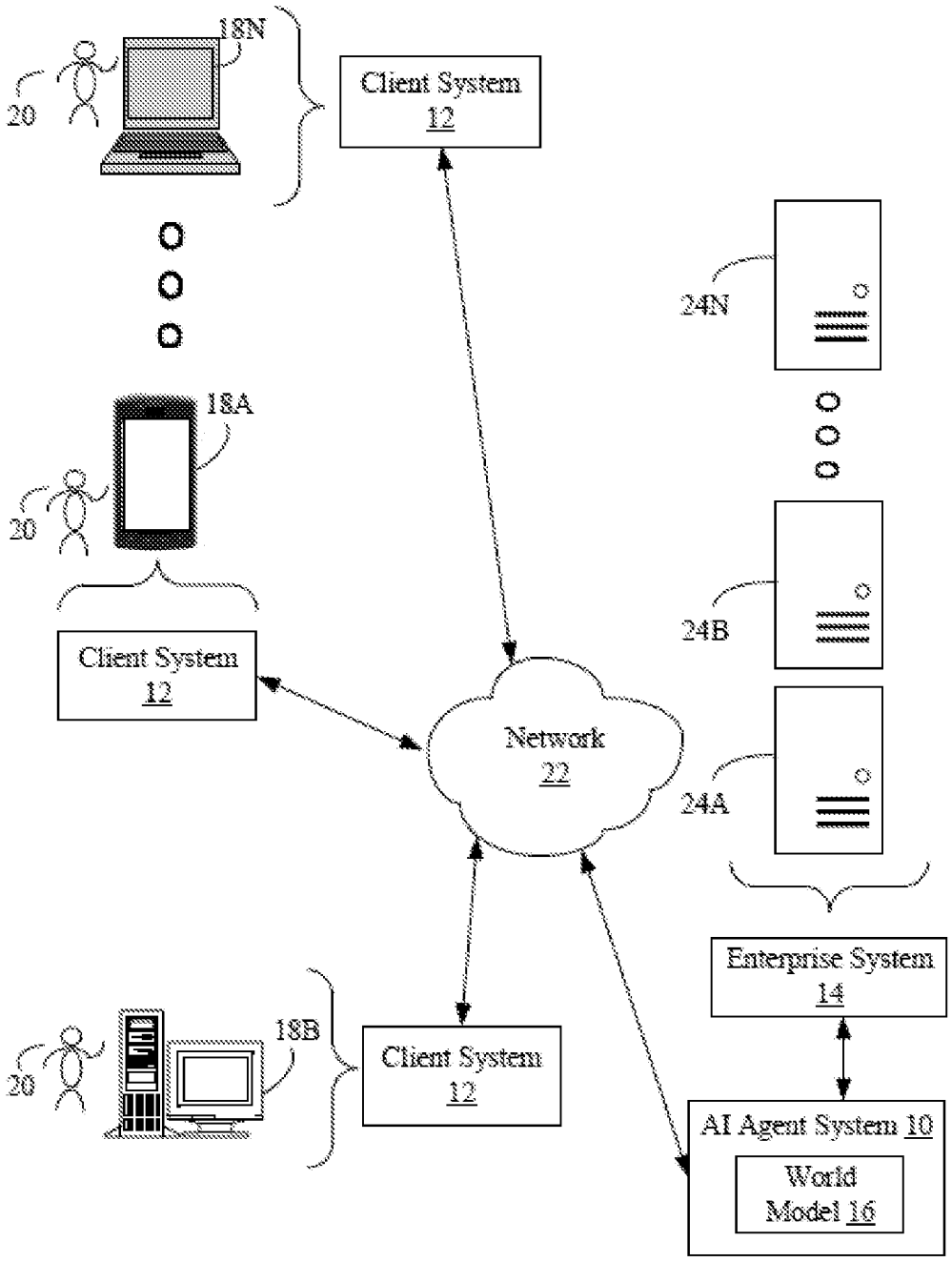
18N
20
Client System
12
24N
18A
20
24B
Client System
12
Network
22
24A
Enterprise System
14
18B
20
Client System
12
AI Agent System 10
World
Model 16

Fig. 2B

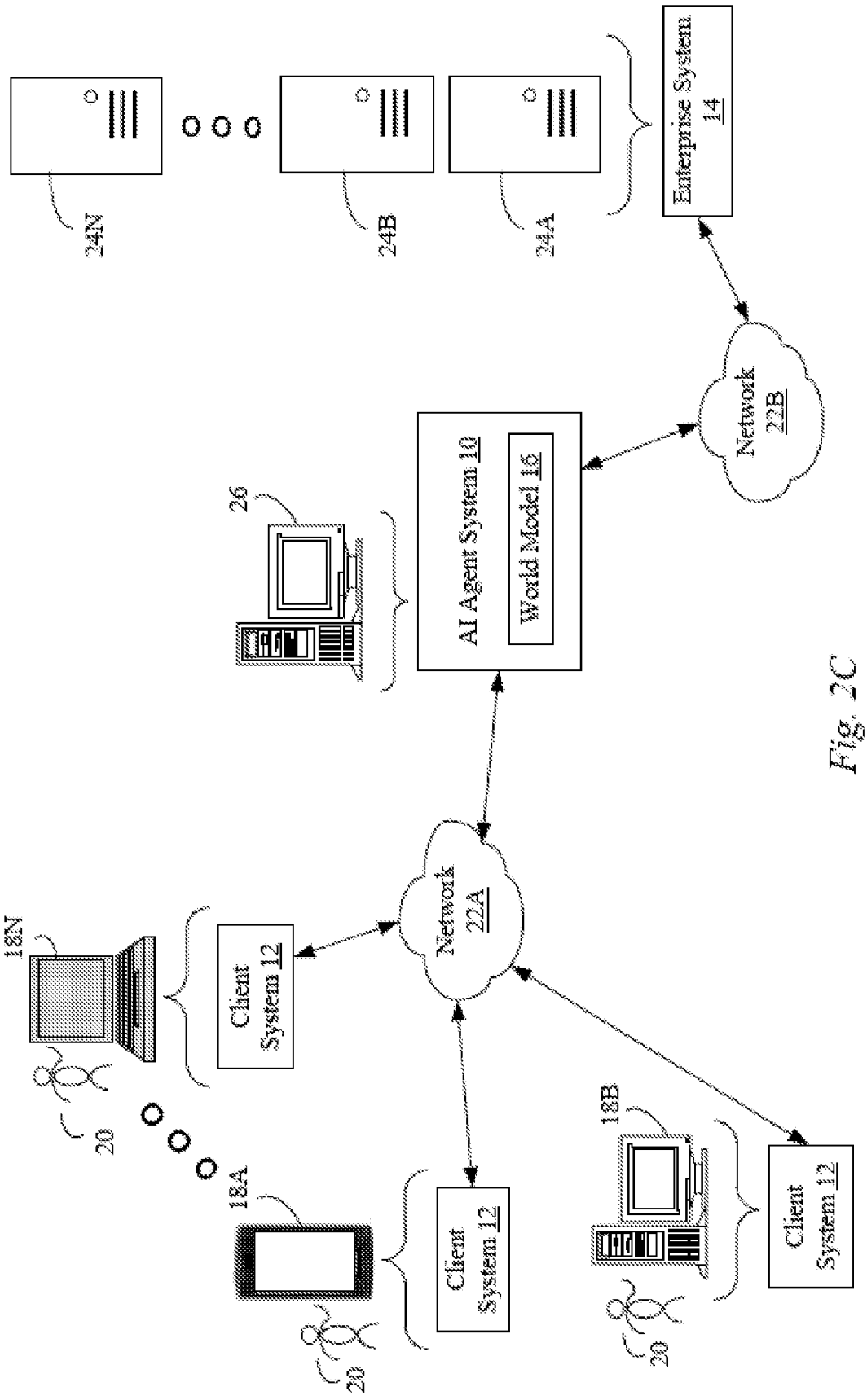
24N
24B
24A
Enterprise System 14
Network 22B
26
AI Agent System 10
World Model 16
Network 22A
18N
Client System 12
20
18A
Client System 12
20
18B
Client System 12
20

Fig. 2C

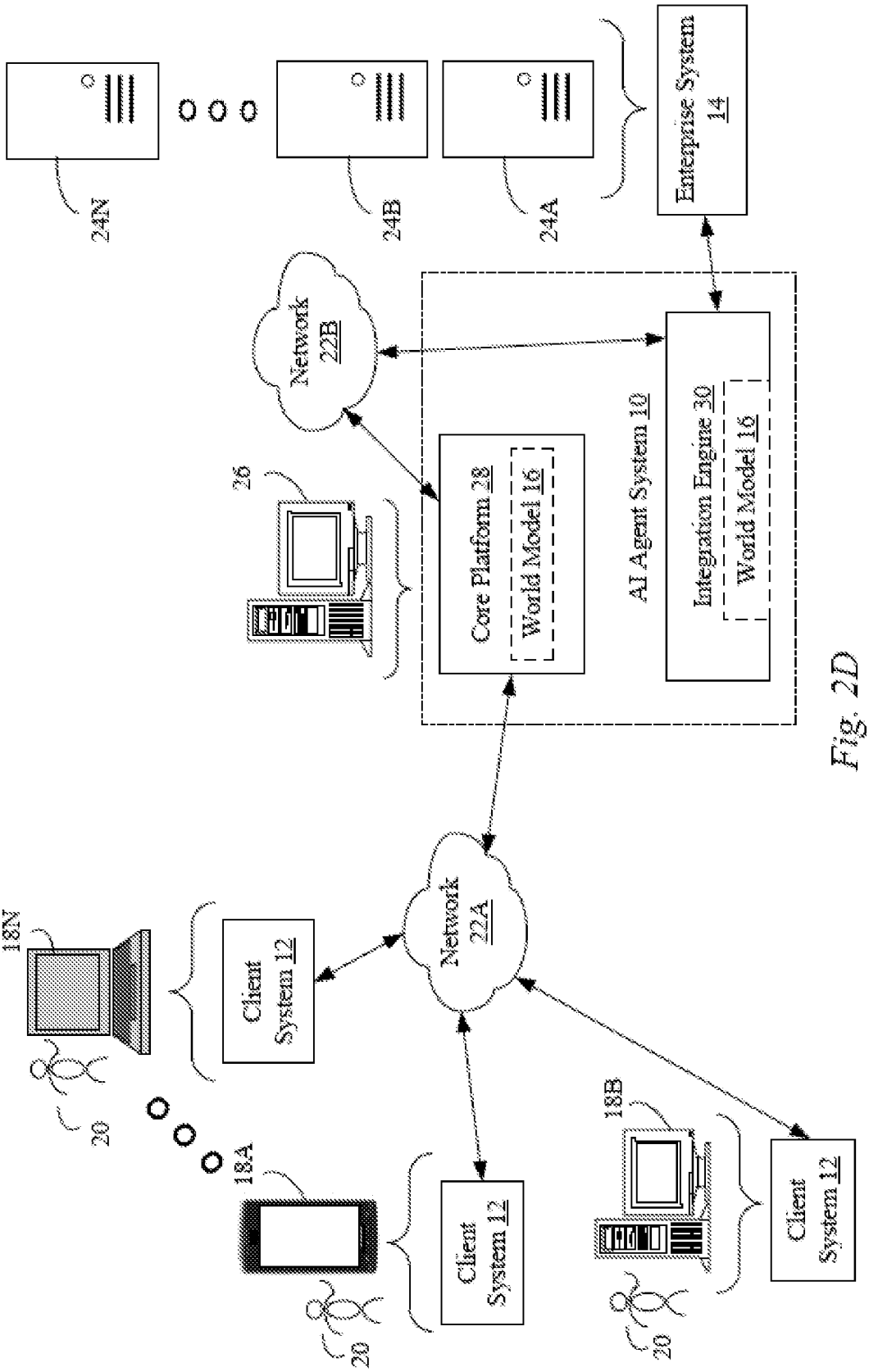
24N
24B
24A
Enterprise System 14
Network 22B
26
Core Platform 28
World Model 16
AI Agent System 10
Integration Engine 30
World Model 16
18N
Client System 12
Network 22A
18A
Client System 12
18B
Client System 12
20
20
20

Fig. 2D

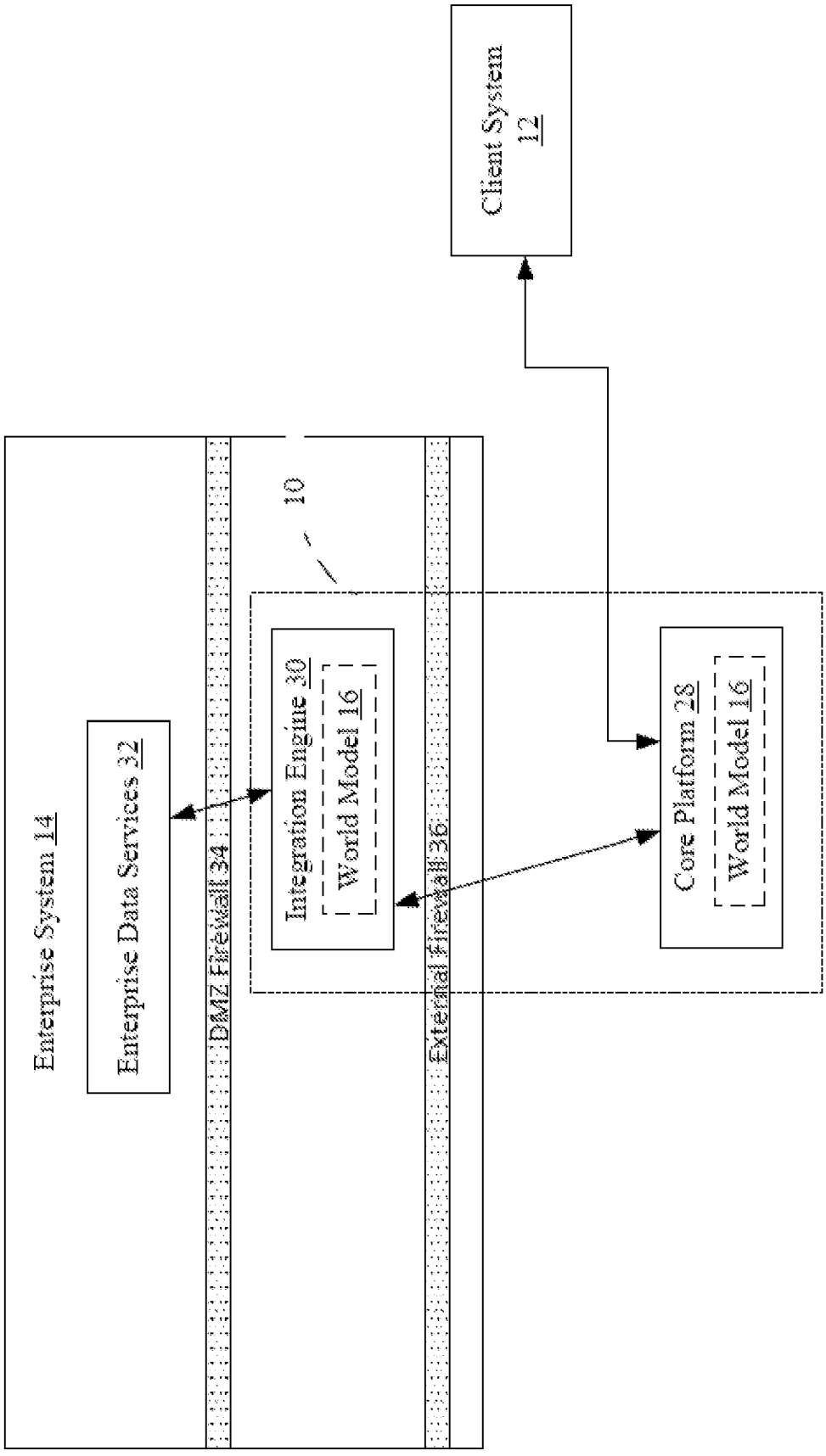
Client System 12
10
Enterprise System 14
Enterprise Data Services 32
DMZ Firewall 34
Integration Engine 30
World Model 16
External Firewall 36
Core Platform 28
World Model 16

Fig. 3

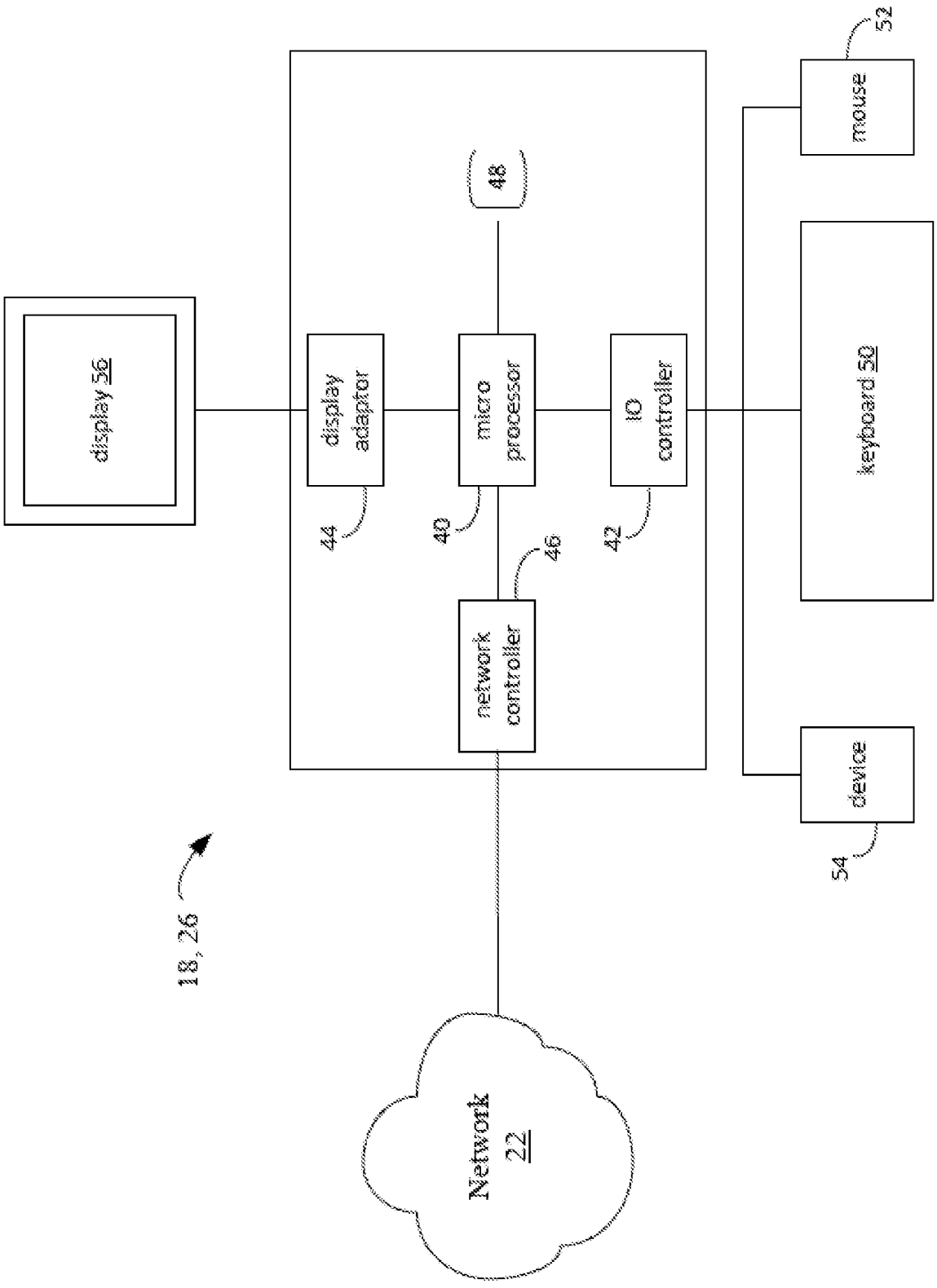
display 56
display adaptor
micro processor
IO controller
network controller
48
44
40
42
46
mouse
52
keyboard 50
device
54
18, 26
Network 22

Fig. 4

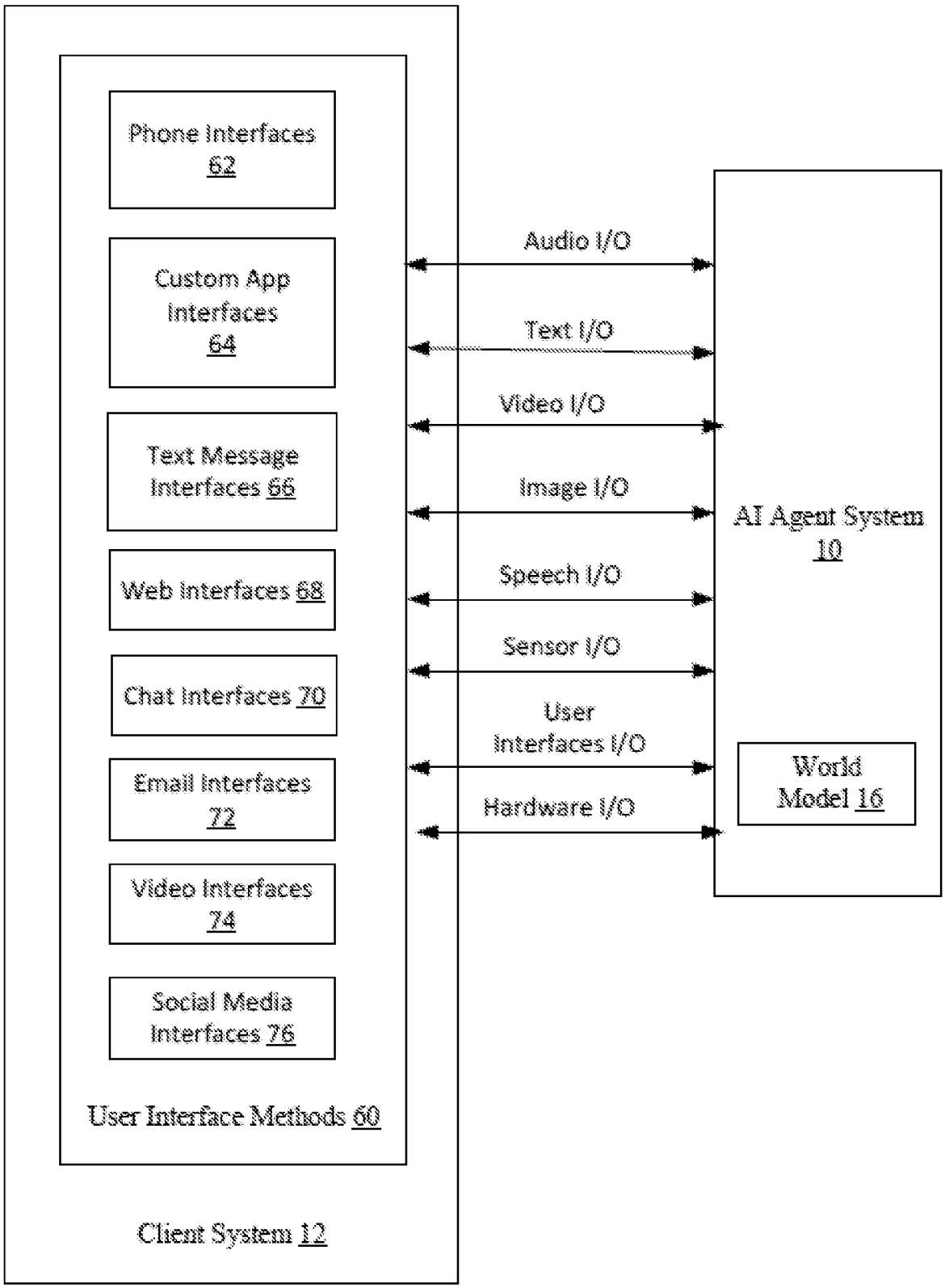
Phone Interfaces 62
Custom App Interfaces 64
Text Message Interfaces 66
Web Interfaces 68
Chat Interfaces 70
Email Interfaces 72
Video Interfaces 74
Social Media Interfaces 76
User Interface Methods 60
Client System 12
Audio I/O
Text I/O
Video I/O
Image I/O
Speech I/O
Sensor I/O
User Interfaces I/O
Hardware I/O
AI Agent System 10
World Model 16

Fig. 5

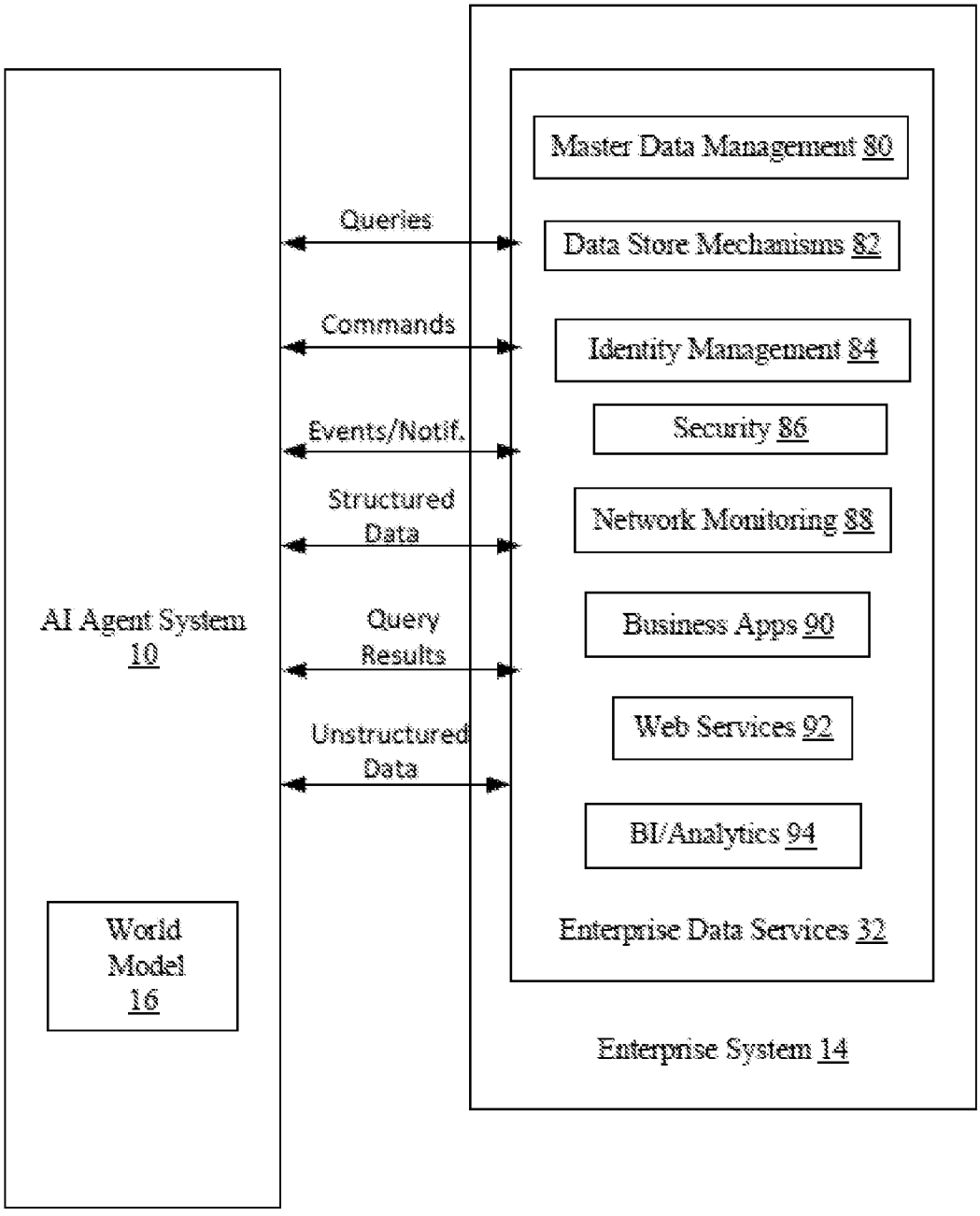
AI Agent System
10
World
Model
16
Queries
Commands
Events/Notif.
Structured
Data
Query
Results
Unstructured
Data
Master Data Management 80
Data Store Mechanisms 82
Identity Management 84
Security 86
Network Monitoring 88
Business Apps 90
Web Services 92
BI/Analytics 94
Enterprise Data Services 32
Enterprise System 14

Fig. 6

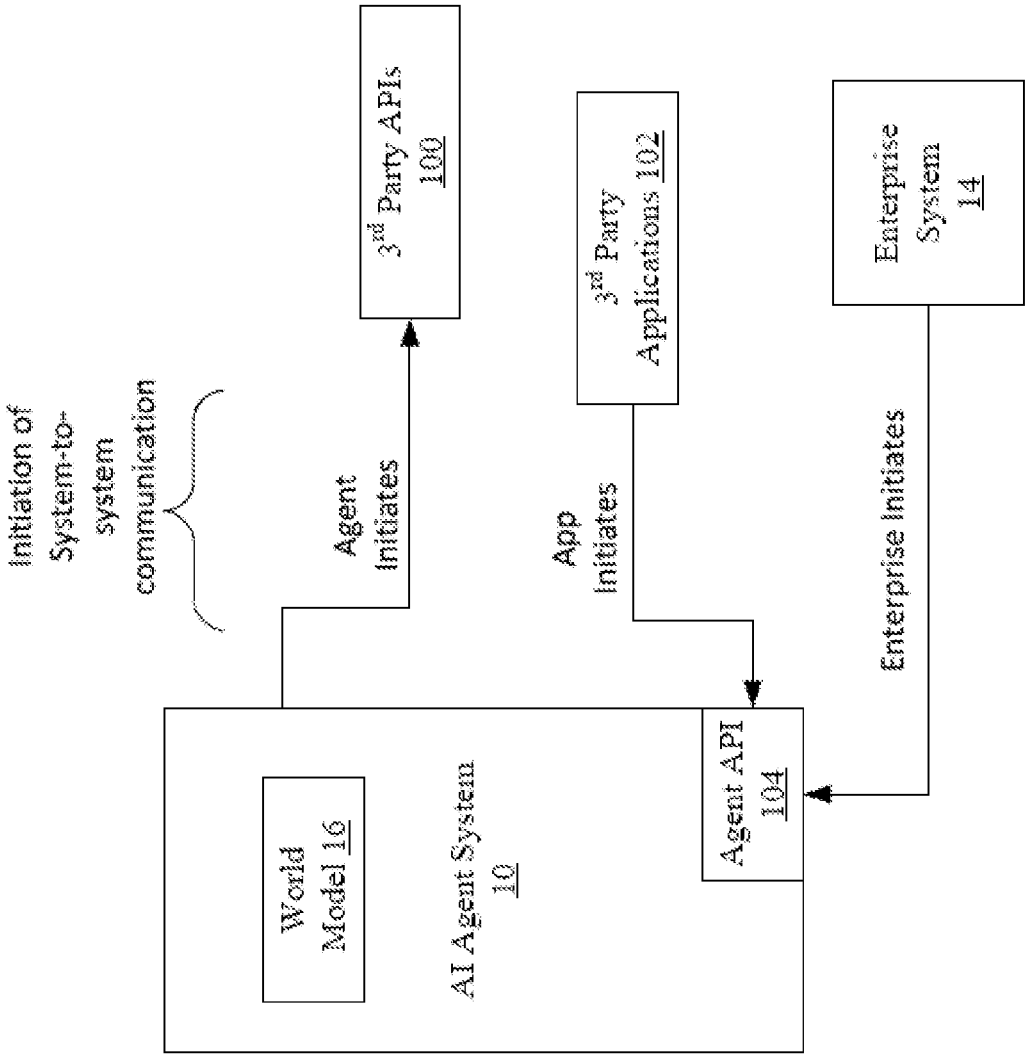
Initiation of System-to-system communication
Agent Initiates
App Initiates
Enterprise Initiates
3rd Party APIs 100
3rd Party Applications 102
Enterprise System 14
World Model 16
AI Agent System 10
Agent API 104

Fig. 7

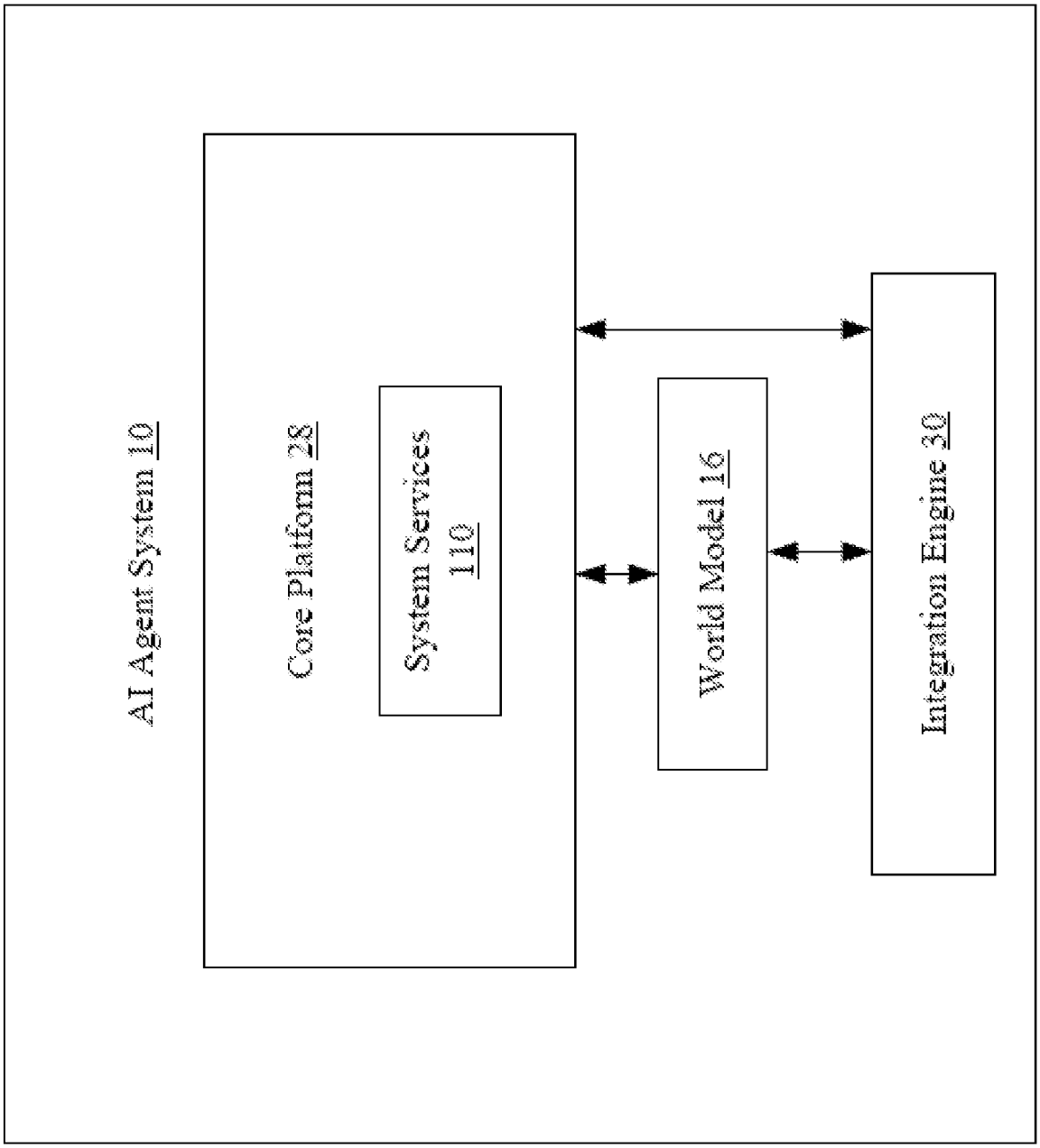
AI Agent System 10
Core Platform 28
System Services 110
World Model 16
Integration Engine 30

Fig. 8

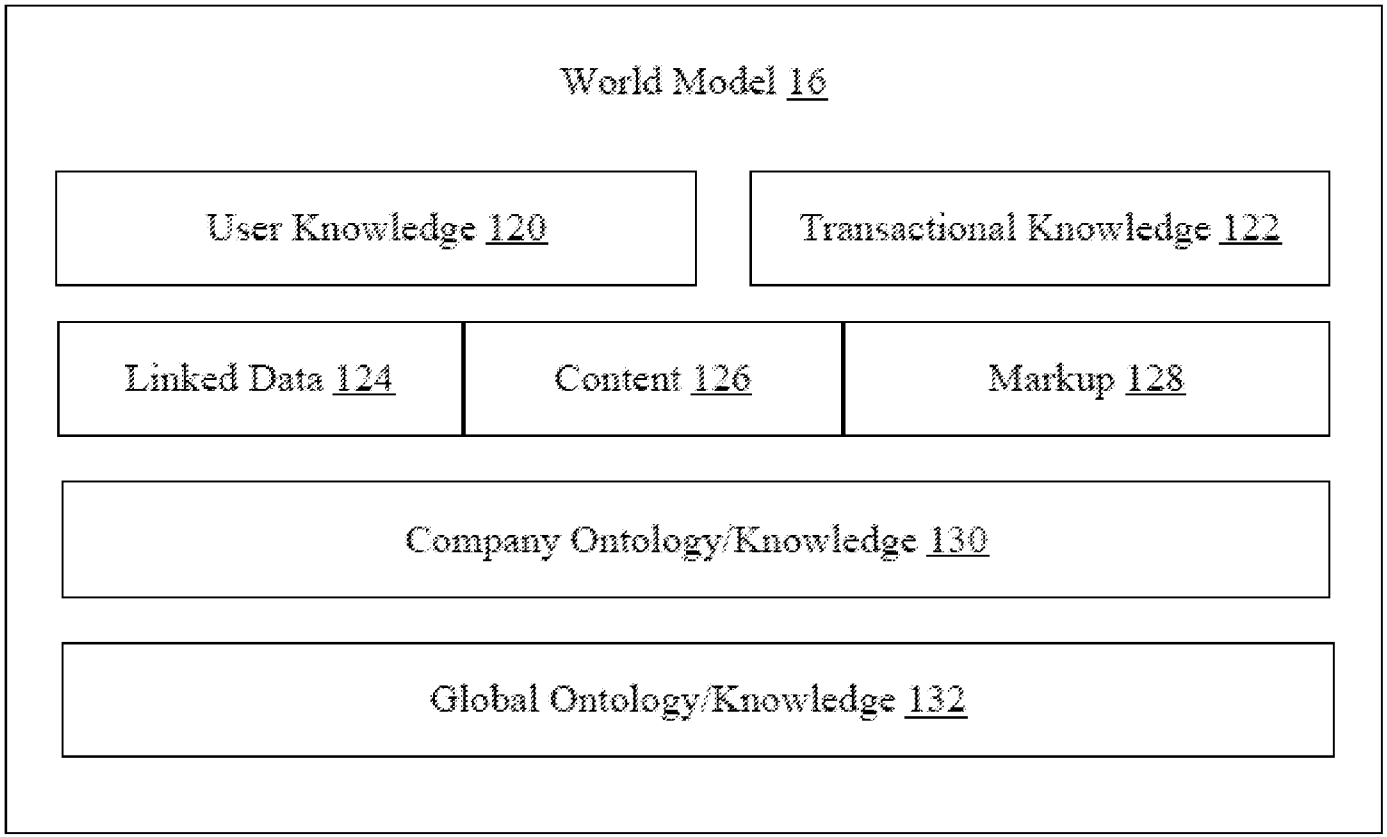
World Model 16
User Knowledge 120
Transactional Knowledge 122
Linked Data 124
Content 126
Markup 128
Company Ontology/Knowledge 130
Global Ontology/Knowledge 132

Fig. 9A

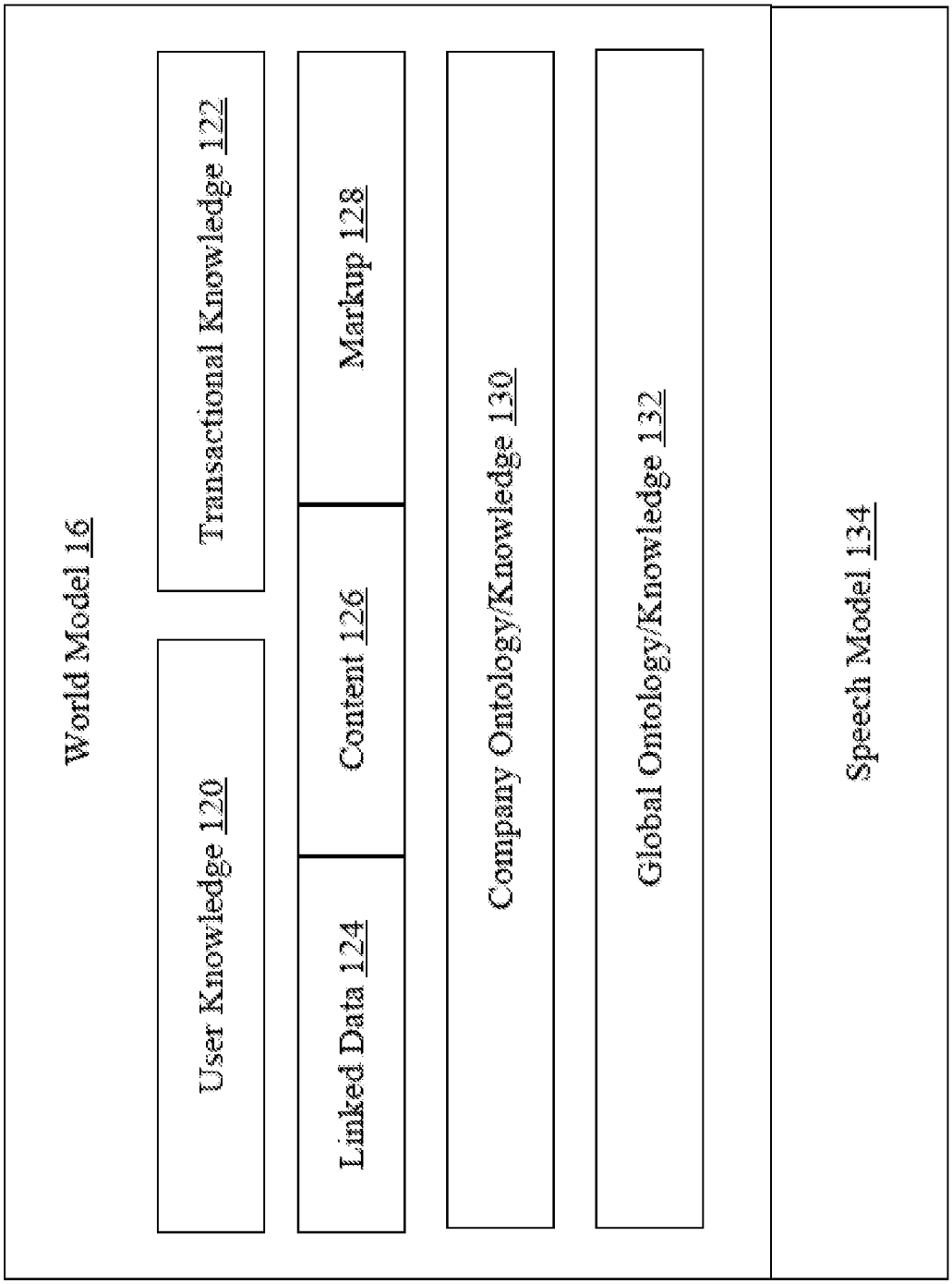
World Model 16
User Knowledge 120
Transactional Knowledge 122
Linked Data 124
Content 126
Markup 128
Company Ontology/Knowledge 130
Global Ontology/Knowledge 132
Speech Model 134

Fig. 9B

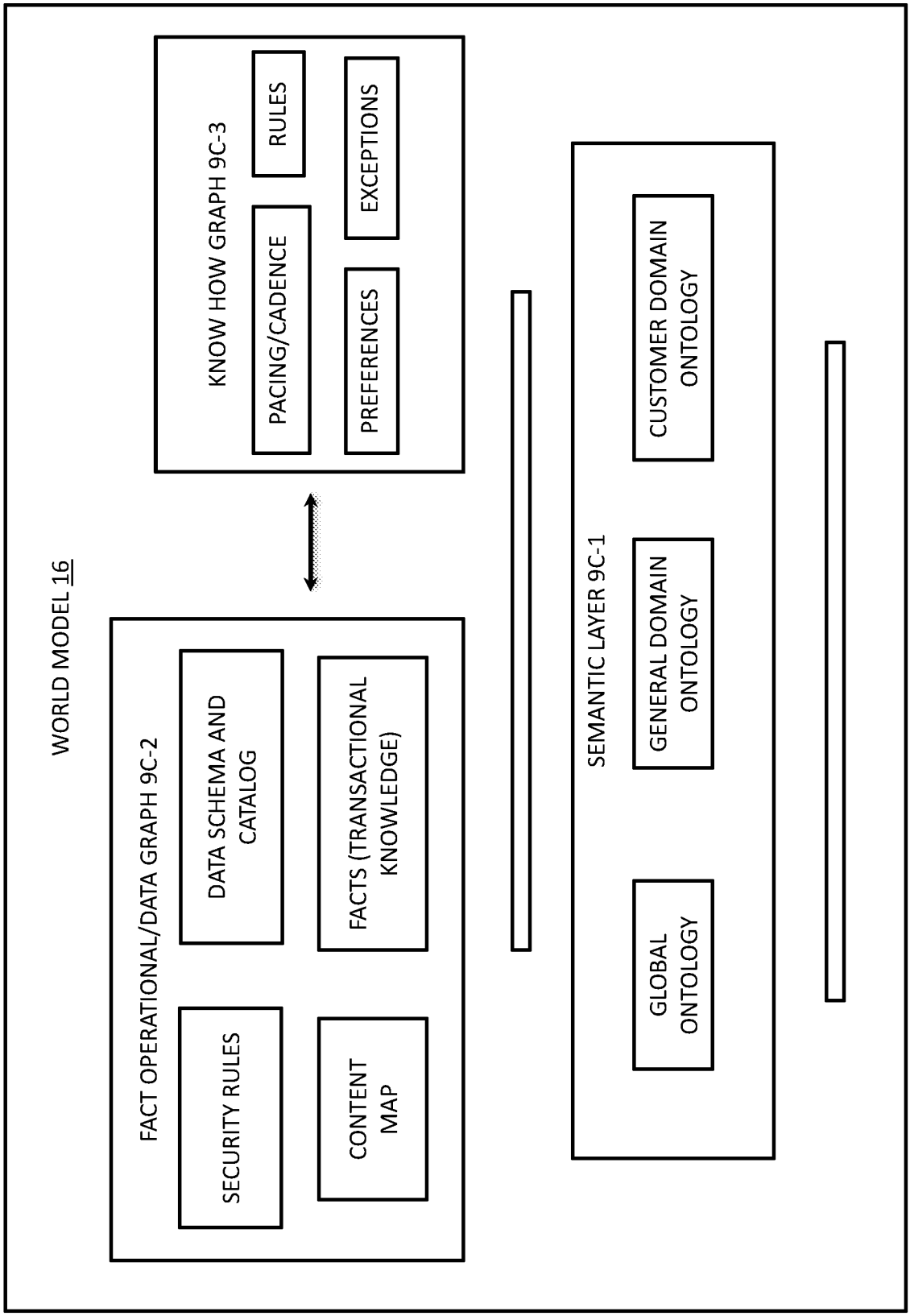
WORLD MODEL 16
KNOW HOW GRAPH 9C-3
RULES
EXCEPTIONS
PACING/CADENCE
PREFERENCES
FACT OPERATIONAL/DATA GRAPH 9C-2
DATA SCHEMA AND CATALOG
FACTS (TRANSACTIONAL KNOWLEDGE)
SECURITY RULES
CONTENT MAP
SEMANTIC LAYER 9C-1
CUSTOMER DOMAIN ONTOLOGY
GENERAL DOMAIN ONTOLOGY
GLOBAL ONTOLOGY

Fig. 9C

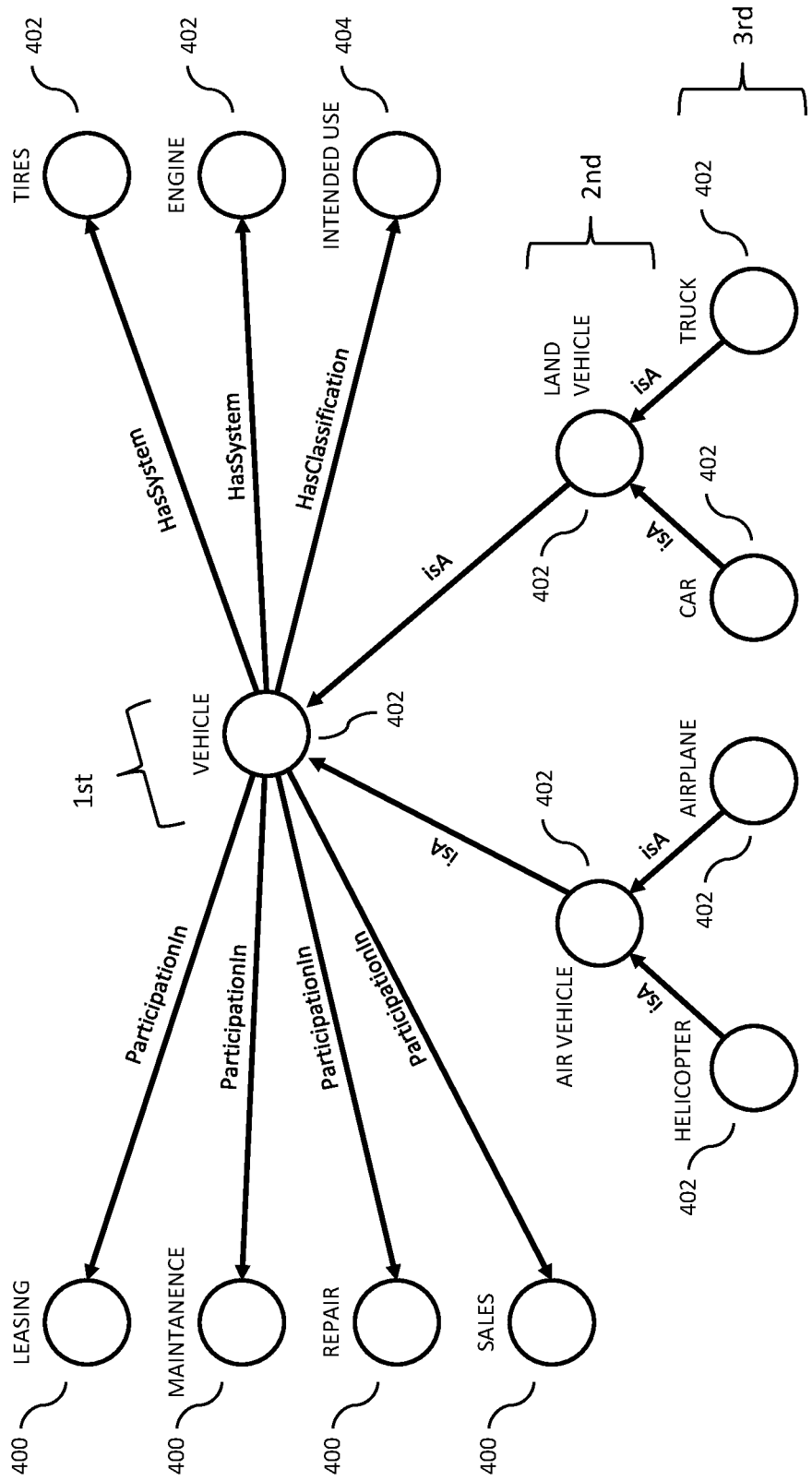
TIRES
402
ENGINE
402
INTENDED USE
404
HasSystem
HasSystem
HasClassification
1st
VEHICLE
402
isA
2nd
LAND VEHICLE
402
TRUCK
402
isA
isA
CAR
402
isA
AIR VEHICLE
402
isA
AIRPLANE
402
isA
HELICOPTER
402
3rd
ParticipationIn
ParticipationIn
ParticipationIn
ParticipationIn
LEASING
400
MAINTANENCE
400
REPAIR
400
SALES
400

Fig. 10A

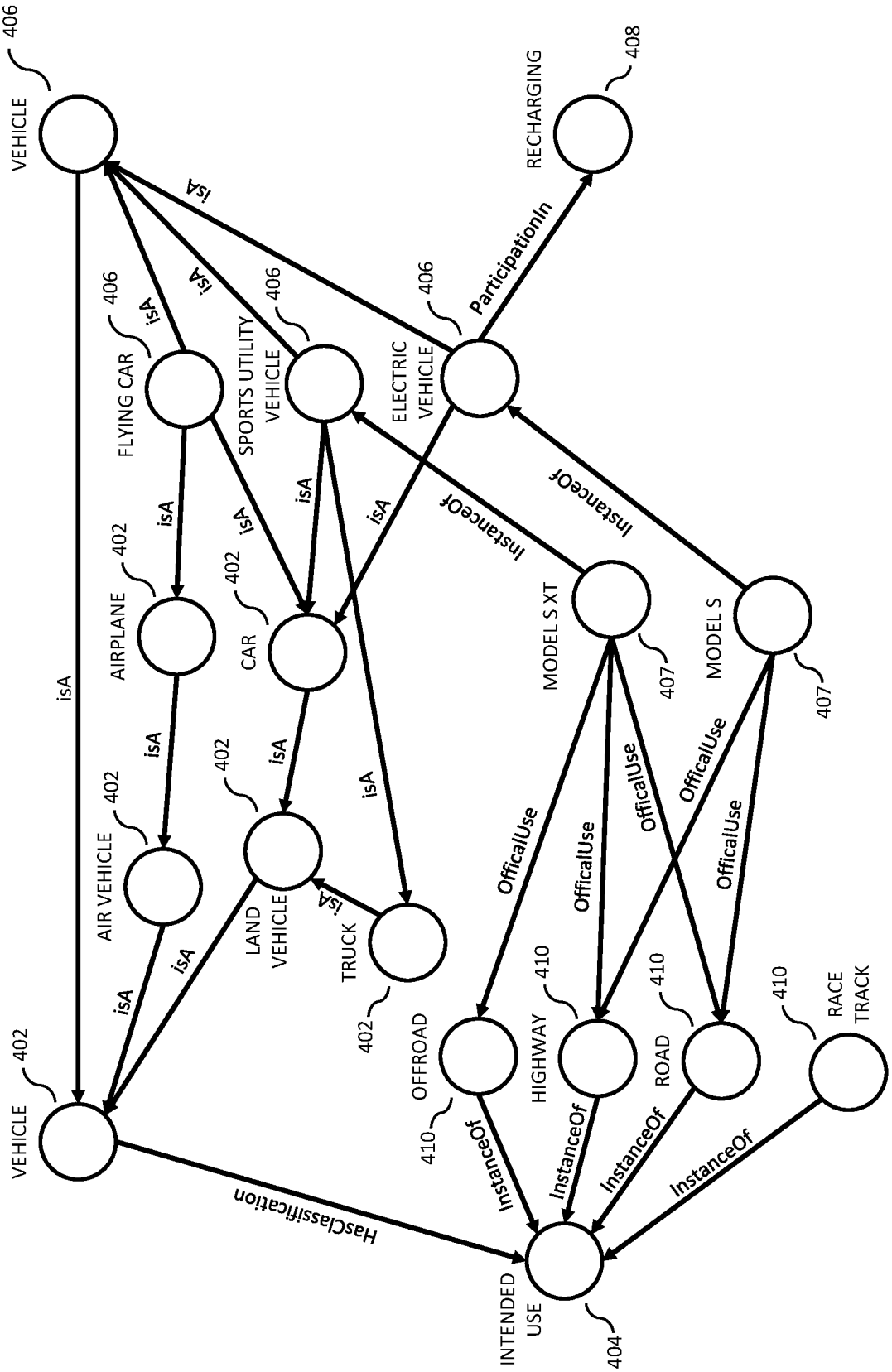
VEHICLE
406
RECHARGING
408
isA
ParticipationIn
FLYING CAR
406
SPORTS UTILITY VEHICLE
406
ELECTRIC VEHICLE
406
InstanceOf
AIRPLANE
402
CAR
402
MODEL S XT
407
MODEL S
407
AIR VEHICLE
402
LAND VEHICLE
402
TRUCK
402
OffICalUse
OFFROAD
410
HIGHWAY
410
ROAD
410
RACE TRACK
410
InstanceOf
HasClassification
VEHICLE
402
INTENDED USE
404

Fig. 10B

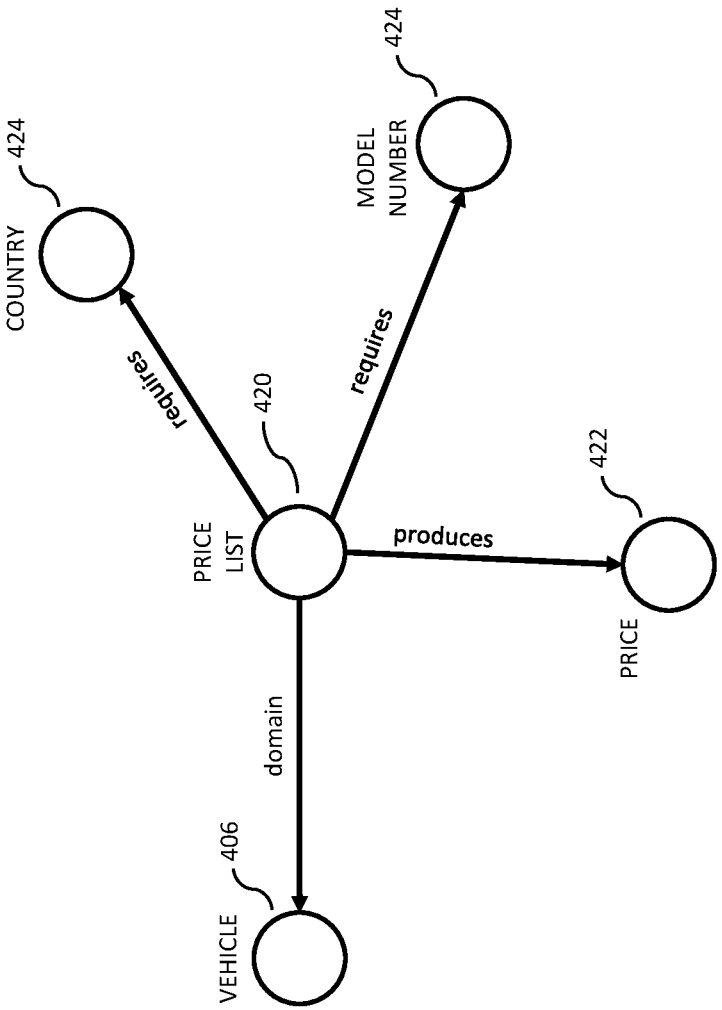
424
COUNTRY
424
MODEL NUMBER
requires
requires
420
PRICE LIST
produces
422
PRICE
domain
406
VEHICLE

Fig. 10C

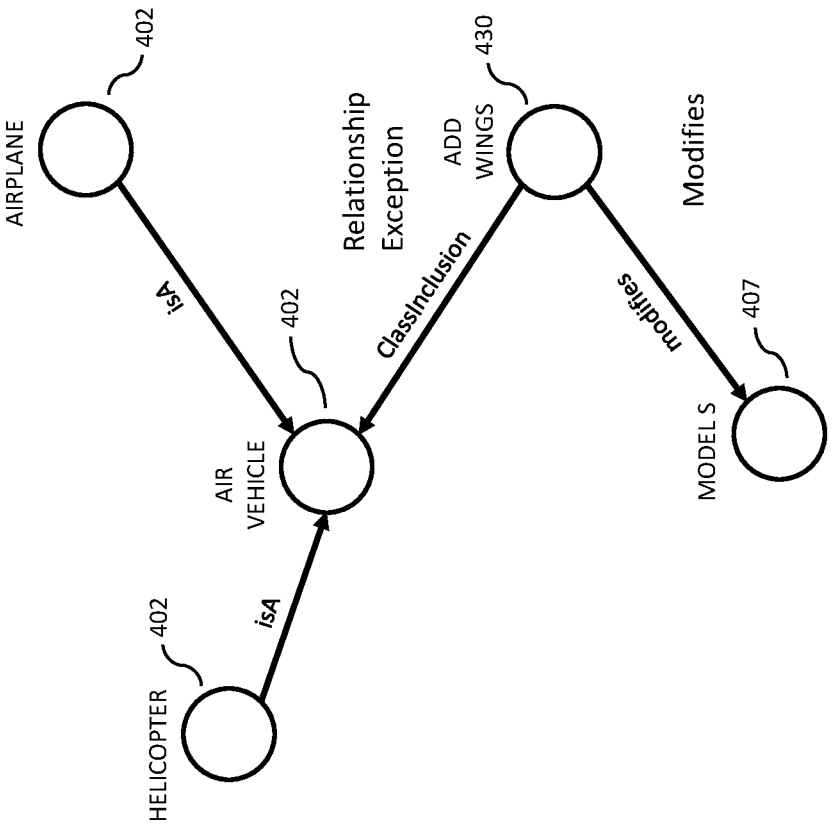
AIRPLANE
402
isA
AIR
VEHICLE
402
Relationship
Exception
ClassInclusion
ADD
WINGS
430
Modifies
modifies
MODEL S
407
HELICOPTER
402
isA

Fig. 10D

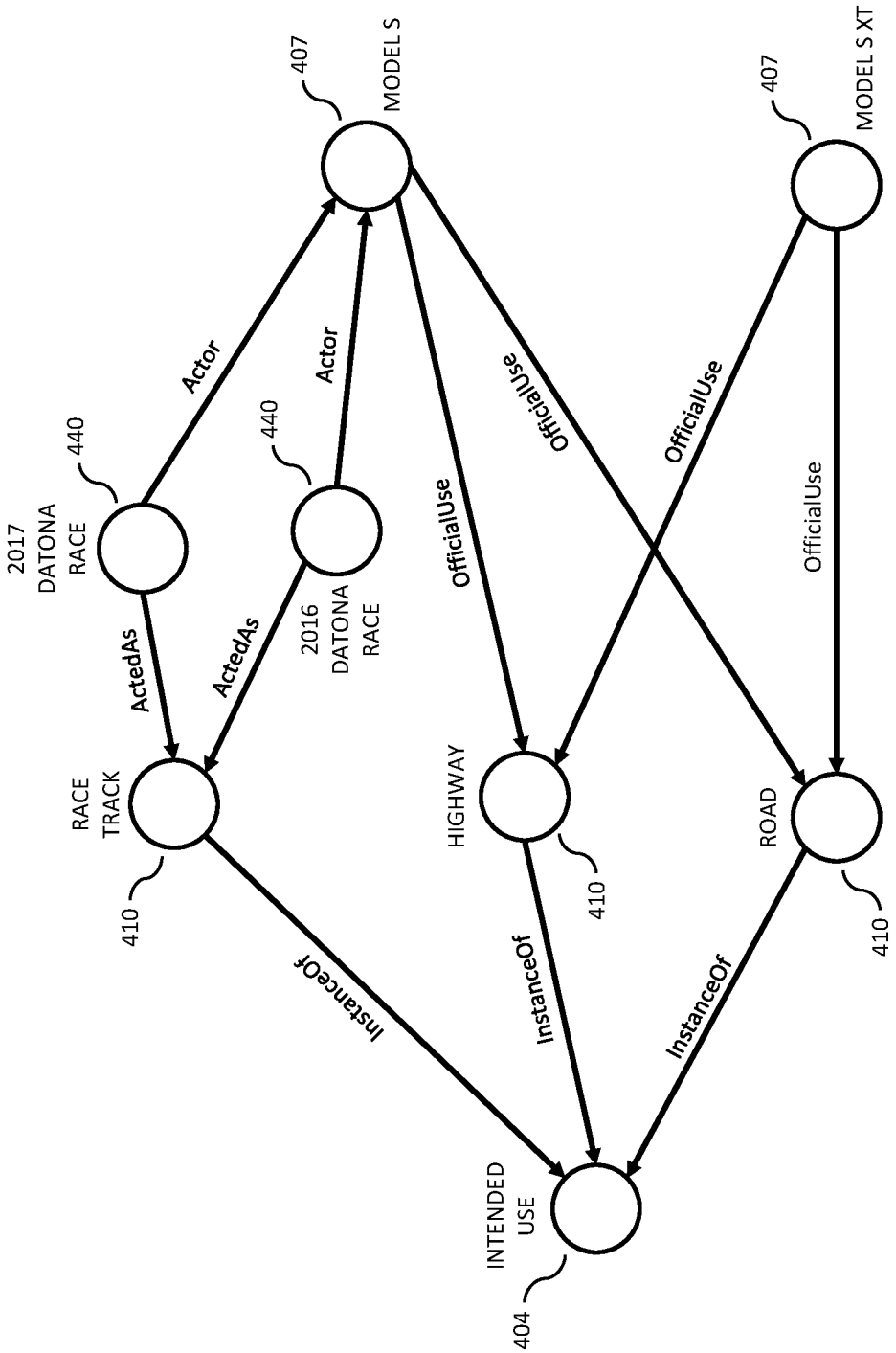
407
MODEL S
407
MODEL S XT
Actor
Actor
OfficialUse
OfficialUse
OfficialUse
440
2017 DATONA RACE
440
2016 DATONA RACE
ActedAs
ActedAs
RACE TRACK
410
HIGHWAY
410
ROAD
410
InstanceOf
InstanceOf
InstanceOf
INTENDED USE
404

Fig. 10E

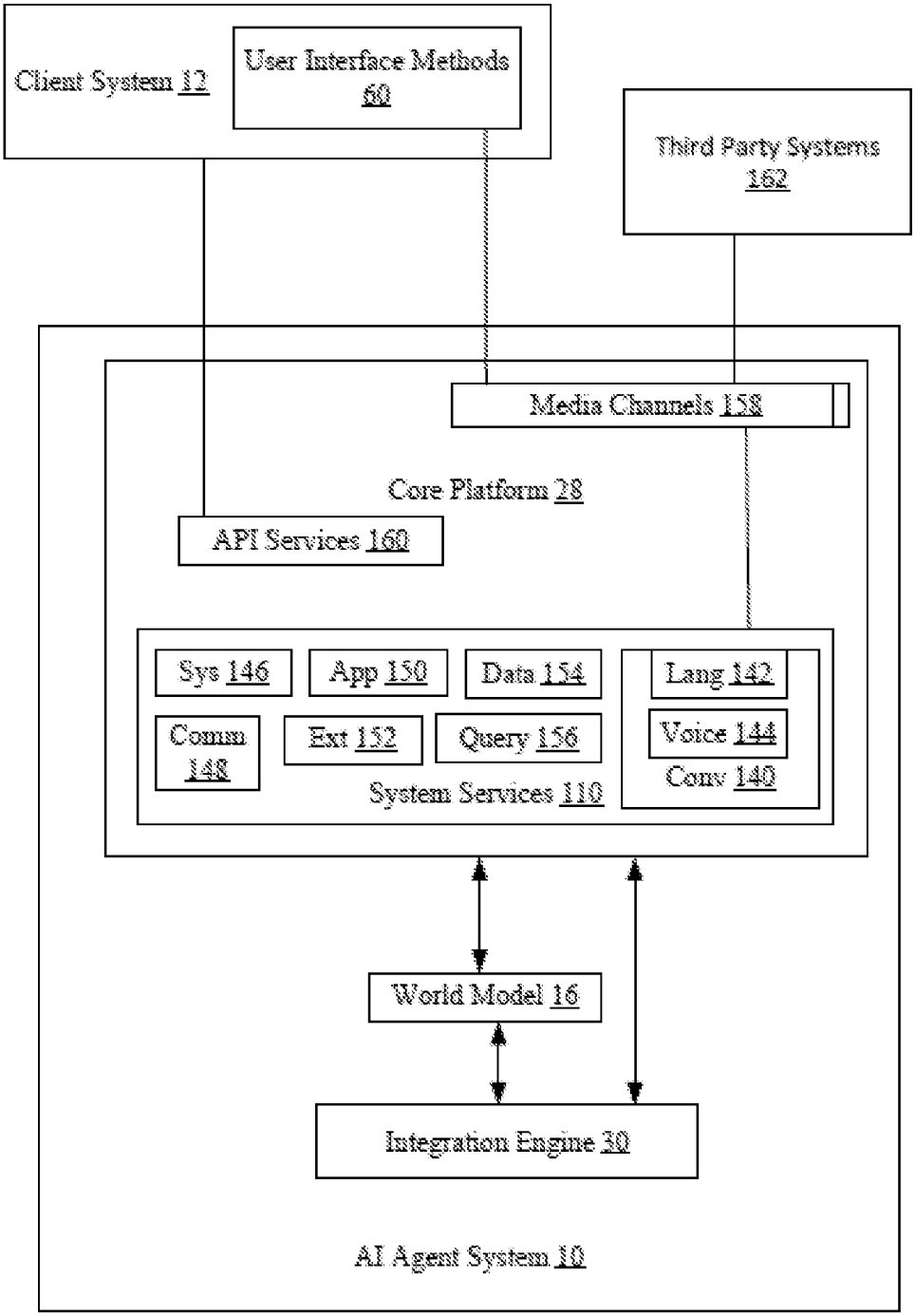
Client System 12
User Interface Methods 60
Third Party Systems 162
Media Channels 158
Core Platform 28
API Services 160
Sys 146
App 150
Data 154
Lang 142
Comm 148
Ext 152
Query 156
Voice 144
Conv 140
System Services 110
World Model 16
Integration Engine 30
AI Agent System 10

Fig. 11

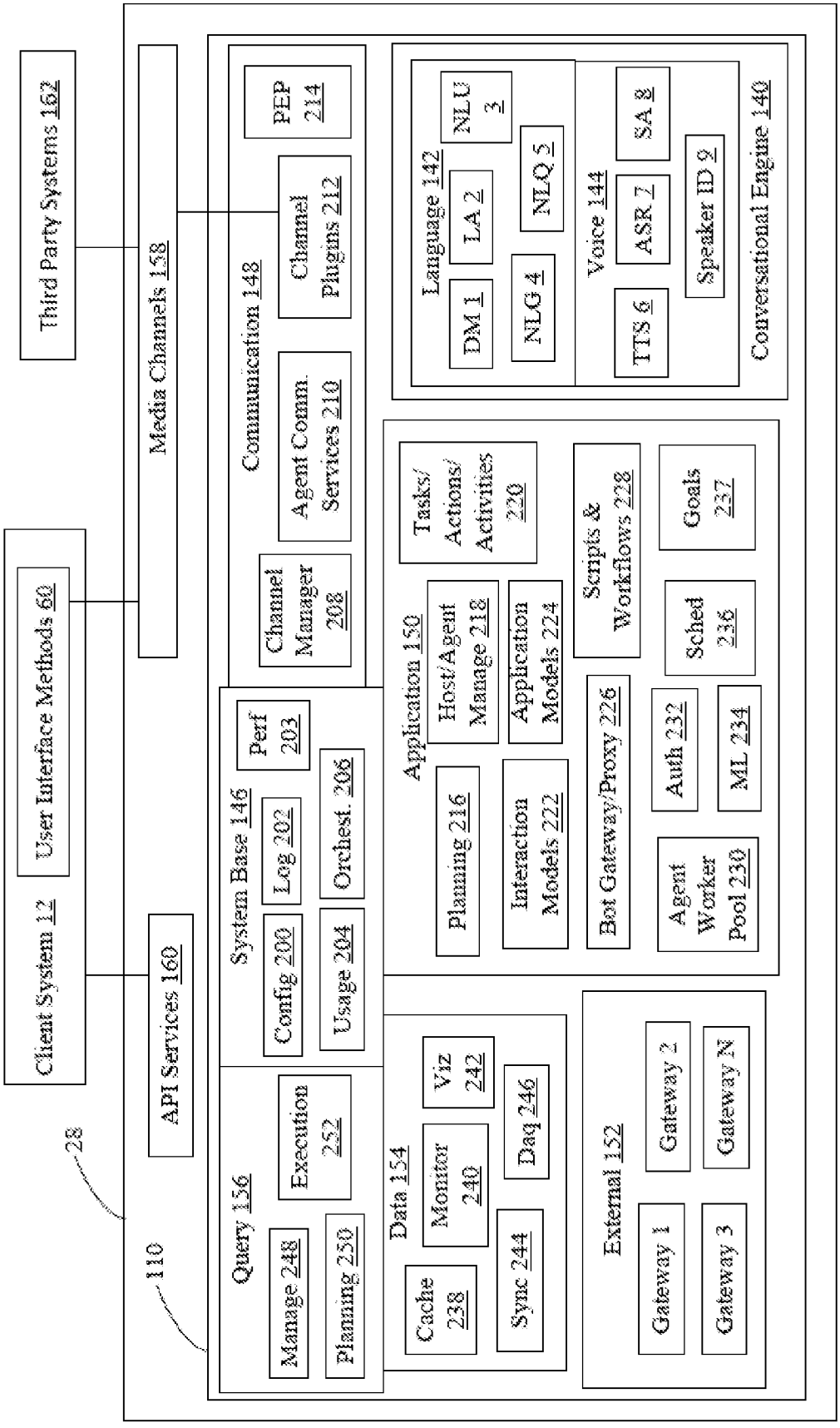
Third Party Systems 162
Client System 12
User Interface Methods 60
API Services 160
28
110
Media Channels 138
Communication 148
Channel Manager 208
Agent Comm. Services 210
Channel Plugins 212
PEP 214
Conversational Engine 140
Language 142
DM 1
LA 2
NLG 4
NLU 3
NLQ 5
Voice 144
TTS 6
ASR 7
Speaker ID 9
SA 8
Application 150
Planning 216
Host/Agent Manage 218
Application Models 224
Tasks/ Actions/ Activities 220
Interaction Models 222
Bot Gateway/Proxy 226
Scripts & Workflows 228
Goals 237
Agent Worker Pool 230
Auth 232
ML 234
Sched 236
System Base 146
Config 200
Log 202
Perf 203
Usage 204
Orchest. 206
Query 156
Manage 248
Execution 252
Planning 250
Data 154
Cache 238
Monitor 240
Viz 242
Sync 244
Daq 246
External 152
Gateway 1
Gateway 2
Gateway 3
Gateway N

Fig. 12

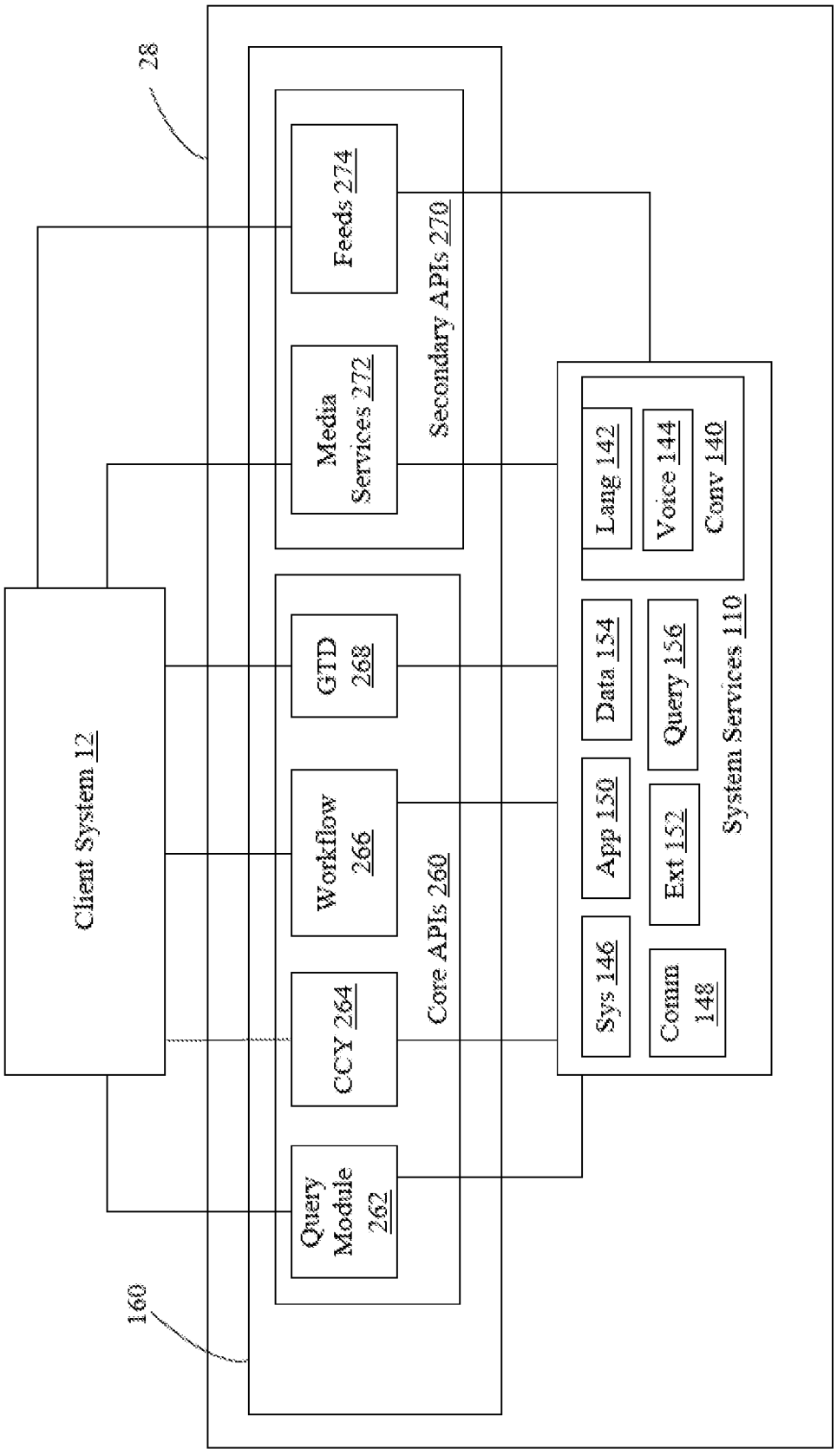
28
Client System 12
Secondary APIs 270
Feeds 274
Media Services 272
Core APIs 260
GTD 268
Workflow 266
CCY 264
Query Module 262
System Services 110
Lang 142
Voice 144
Conv 140
Data 154
App 150
Query 156
Ext 152
Sys 146
Comm 148
160

Fig. 13

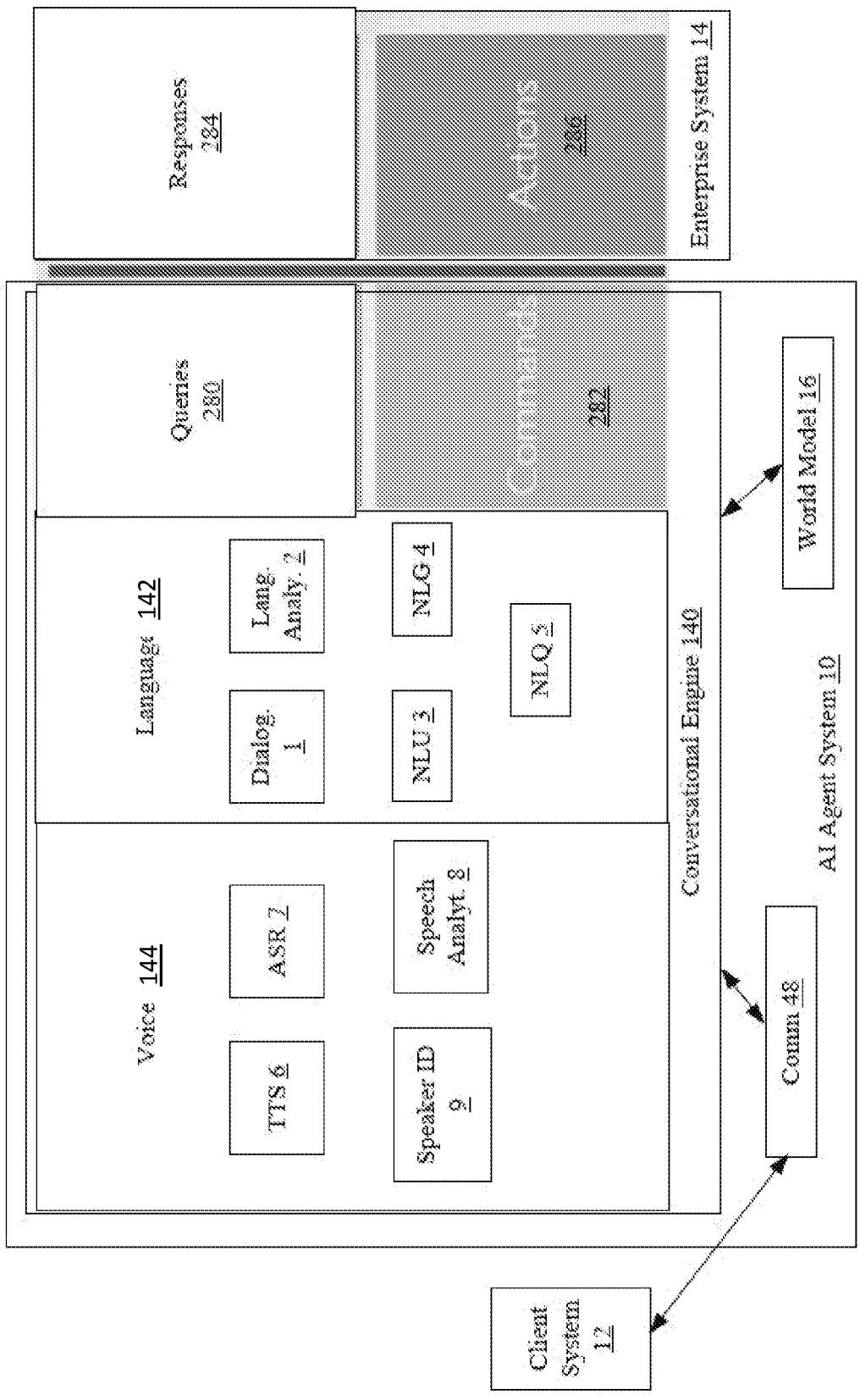
Client System 12
Comm 48
AI Agent System 10
Conversational Engine 140
World Model 16
Voice 144
TTS 6
ASR 7
Speaker ID 9
Speech Analyt. 8
Language 142
Dialog. 1
Lang. Analy. 2
NLU 3
NLG 4
NLQ 5
Queries 280
Responses 284
Enterprise System 14

Fig. 14

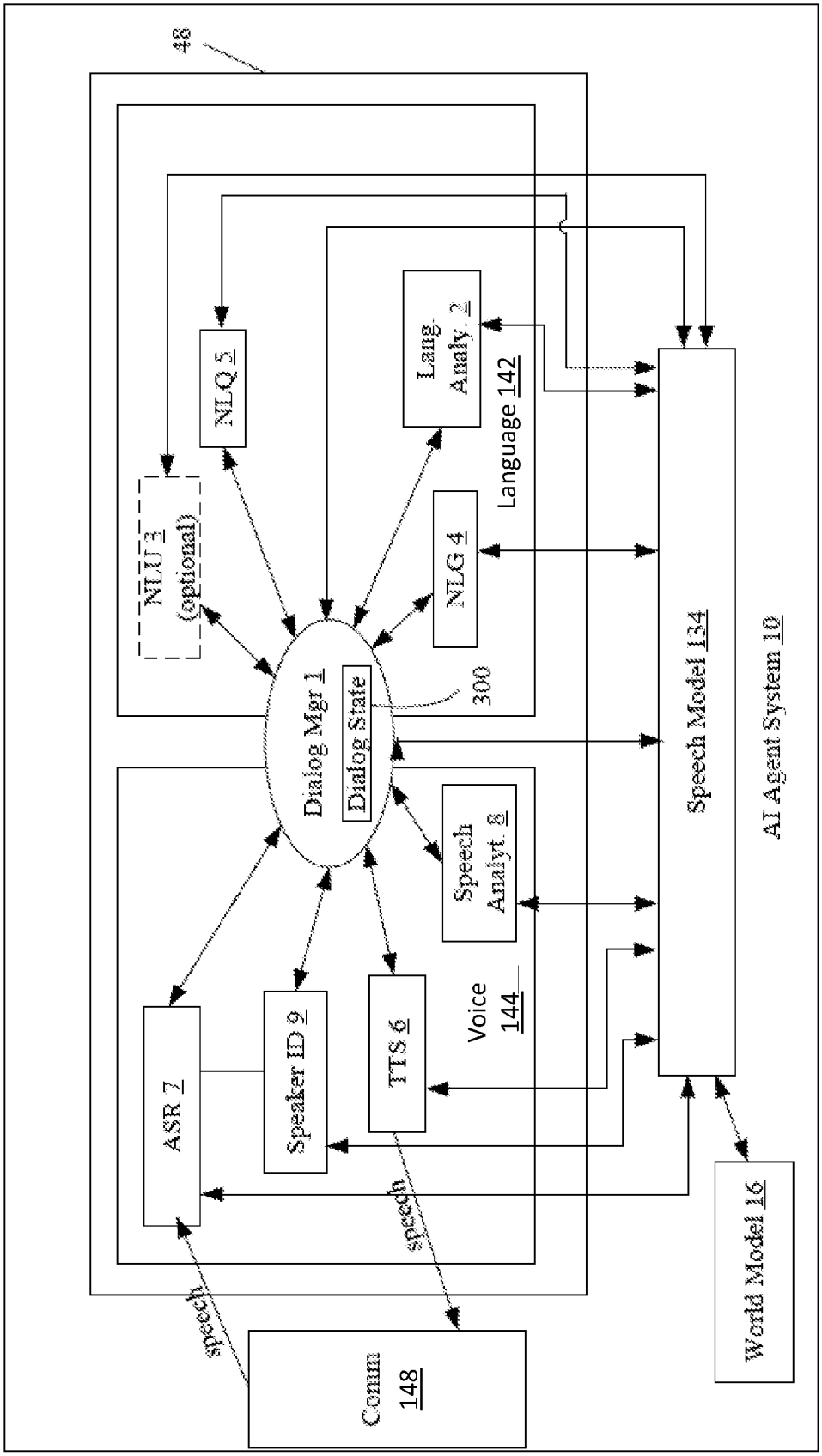
48
NLU 3 (optional)
NLG 5
Lang Analy. 2
Language 142
NLG 4
Dialog Mgr 1
Dialog State
300
Speech Analyt. 8
Speech Model 134
AI Agent System 10
ASR 7
Speaker ID 9
TTS 6
Voice 144
speech
speech
Comm 148
World Model 16

Fig. 15

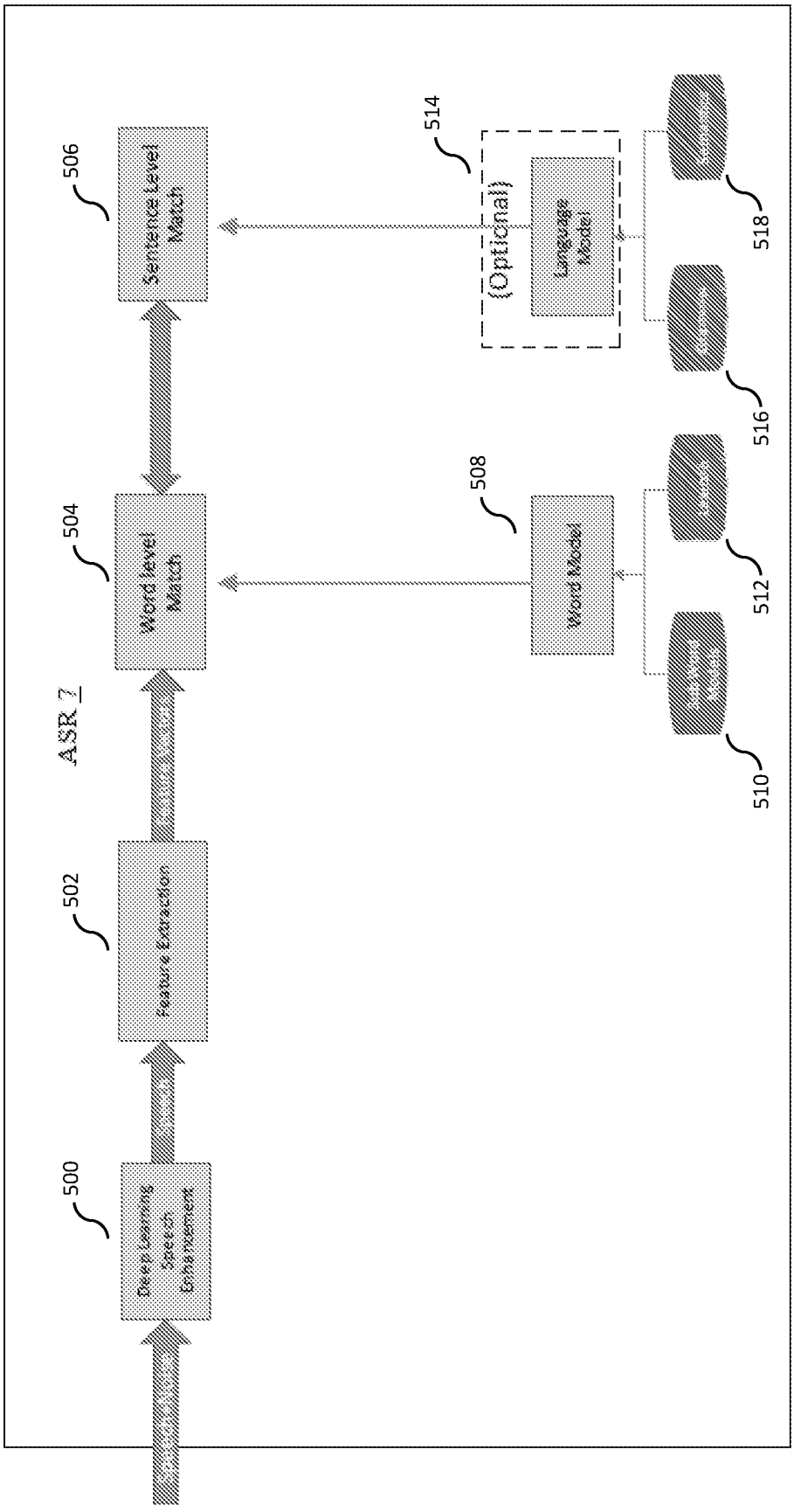
ASR 7
500
Deep Learning Speech Enhancement
502
Feature Extraction
504
Word level Match
506
Sentence Level Match
508
Word Model
510
512
516
518
514
{Optional}
Language Model

Fig. 16

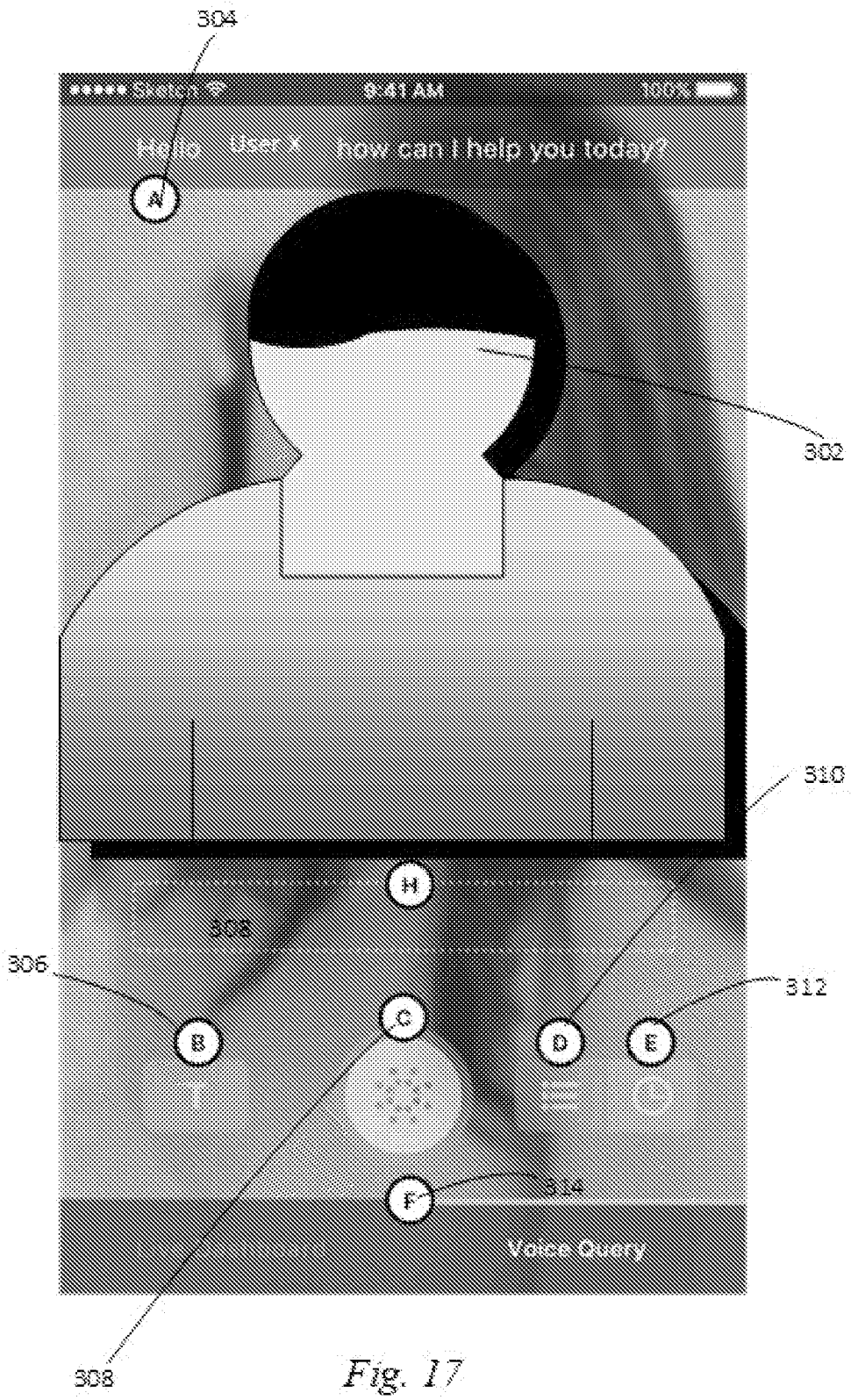
304
9:41 AM
100%
Hello User X how can I help you today?
A
302
310
H
306
312
B
C
D
E
F
314
Voice Query
308

Fig. 17


Sketch
9:41 AM
100%
Address
Summary
144
1197 hrs
1300 hrs
14 Day Trend
16582 kWh
2711 kWh
26572 hrs
25.6 hrs
Live Dashboard

Fig. 18

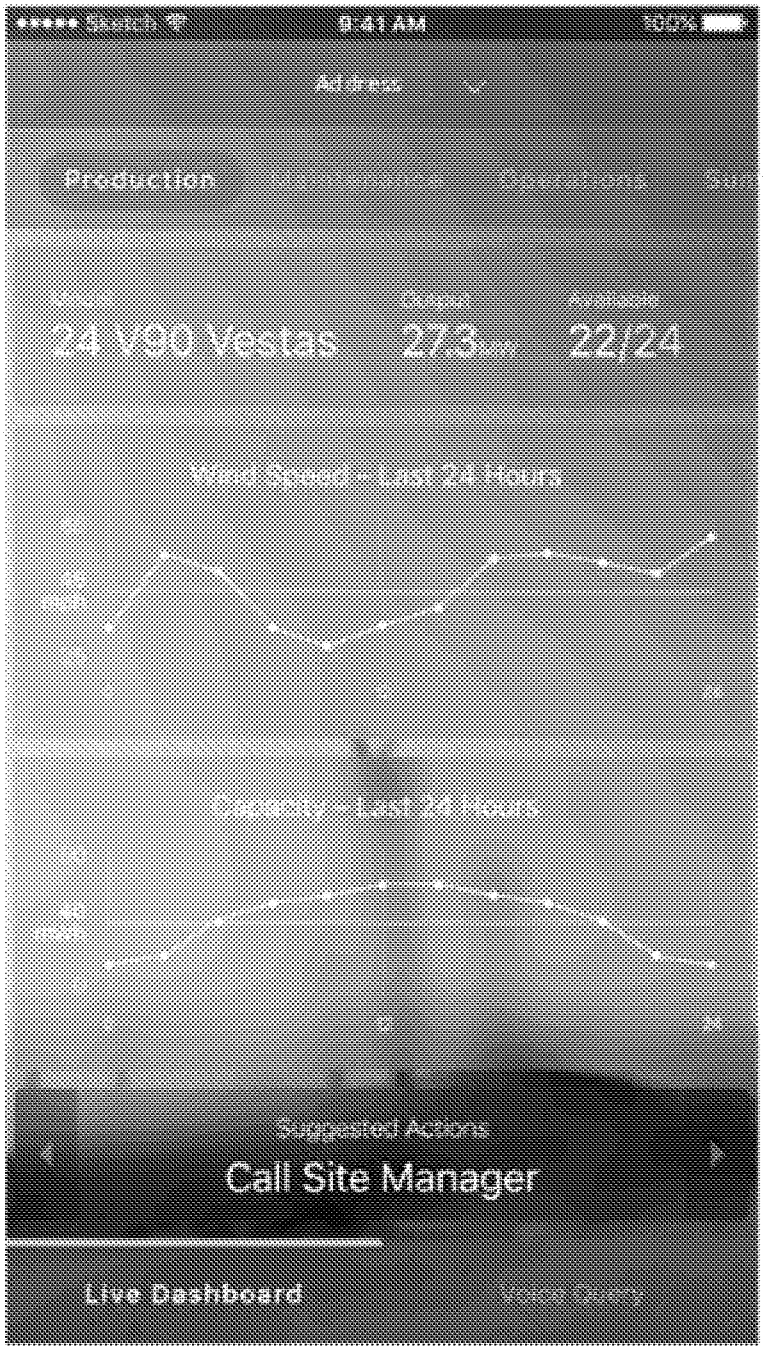
9:41 AM
Production
24 V90 Vestas
273
22/24
Suggested Actions
Call Site Manager
Live Dashboard

Fig. 19

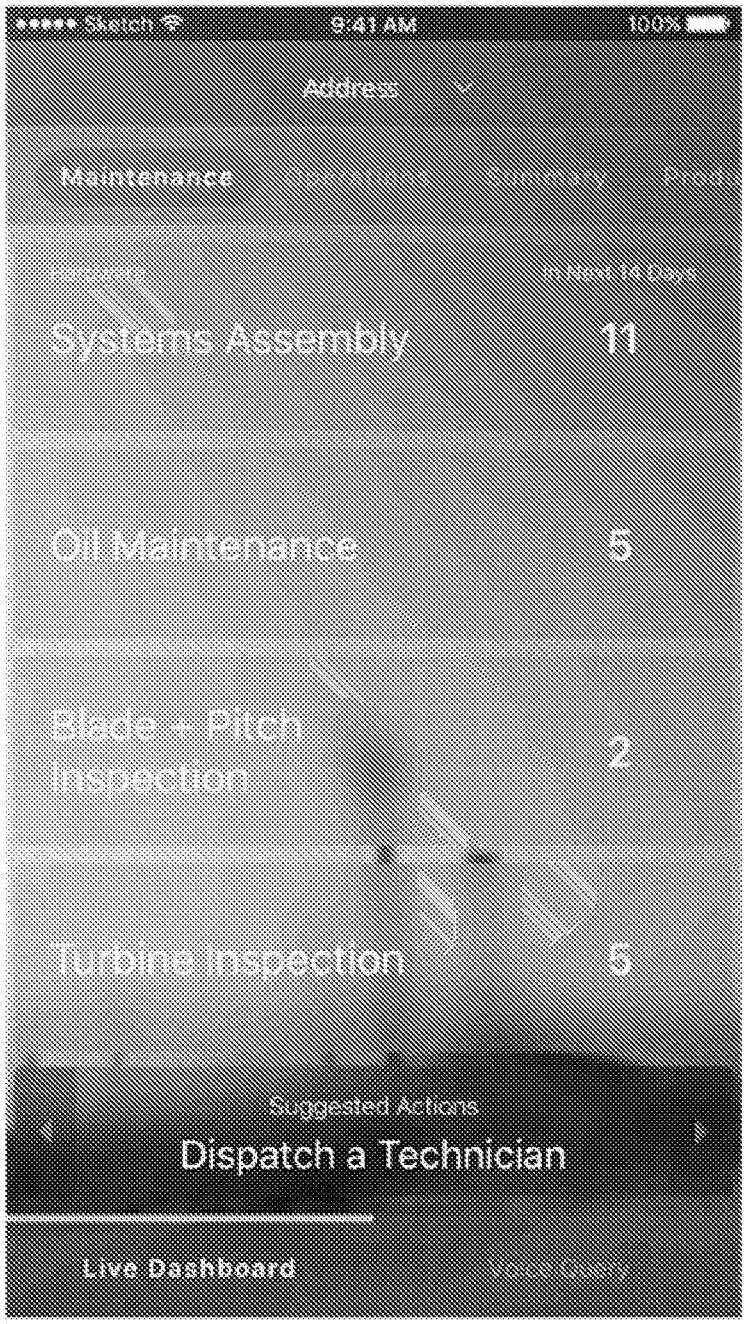
Sketch
9:41 AM
100%
Address
Maintenance
Systems Assembly
11
Oil Maintenance
5
Blade + Pitch Inspection
2
Turbine Inspection
5
Suggested Actions
Dispatch a Technician
Live Dashboard

Fig. 20

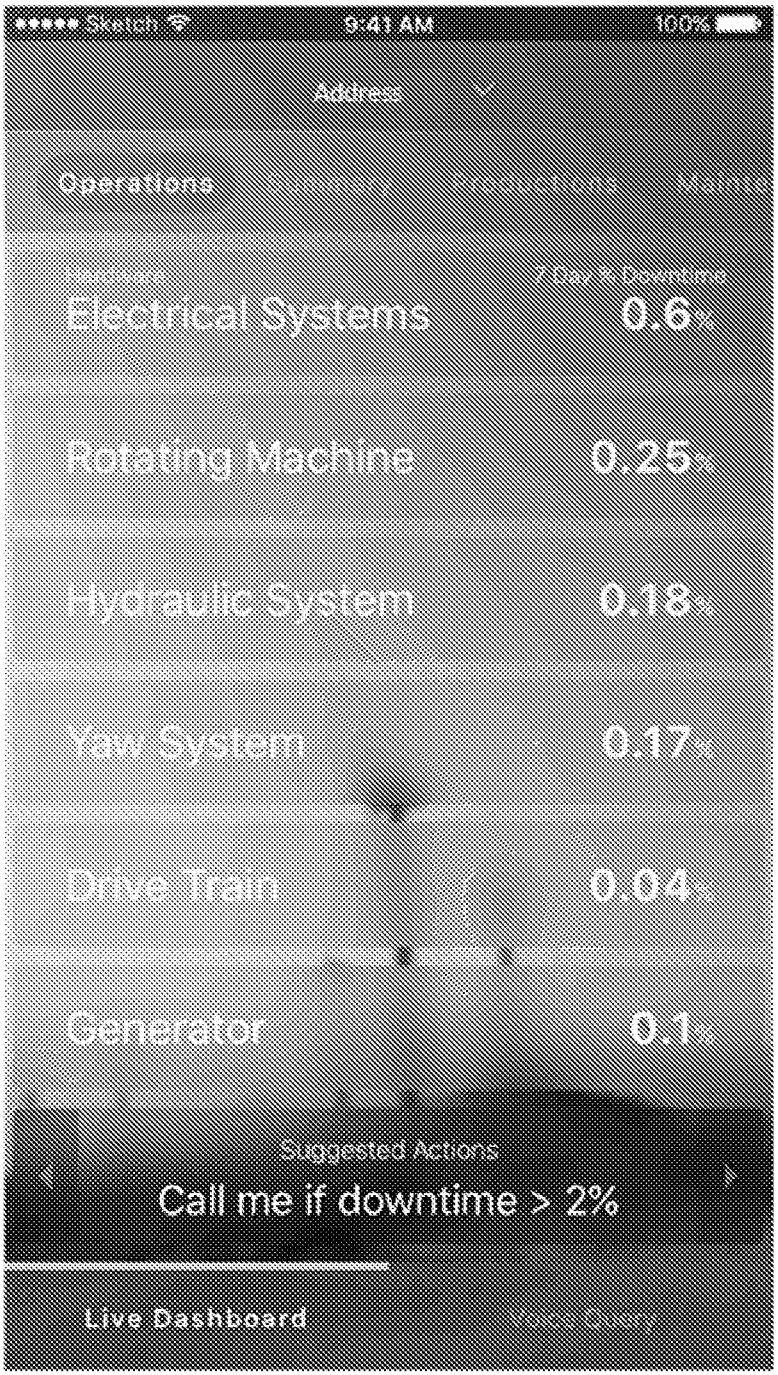
Sketch
9:41 AM
100%
Address
Operations
Electrical Systems
0.6%
Rotating Machine
0.25%
Hydraulic System
0.18%
Yaw System
0.17%
Drive Train
0.04%
Generator
0.1%
Suggested Actions
Call me if downtime > 2%
Live Dashboard

Fig. 21

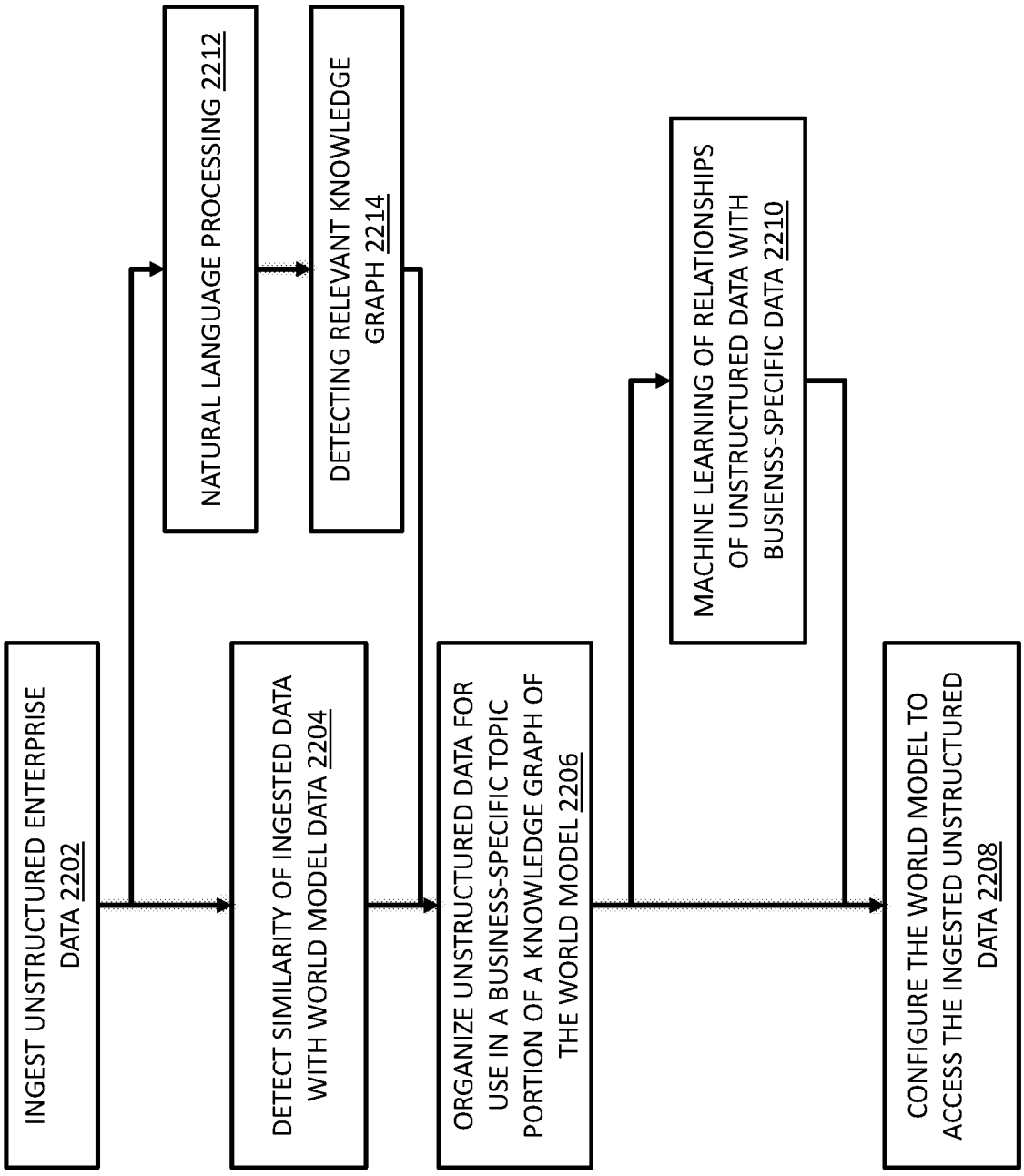
INGEST UNSTRUCTURED ENTERPRISE DATA 2202
NATURAL LANGUAGE PROCESSING 2212
DETECTING RELEVANT KNOWLEDGE GRAPH 2214
DETECT SIMILARITY OF INGESTED DATA WITH WORLD MODEL DATA 2204
ORGANIZE UNSTRUCTURED DATA FOR USE IN A BUSINESS-SPECIFIC TOPIC PORTION OF A KNOWLEDGE GRAPH OF THE WORLD MODEL 2206
MACHINE LEARNING OF RELATIONSHIPS OF UNSTRUCTURED DATA WITH BUSIENSS-SPECIFIC DATA 2210
CONFIGURE THE WORLD MODEL TO ACCESS THE INGESTED UNSTRUCTURED DATA 2208

FIG 22

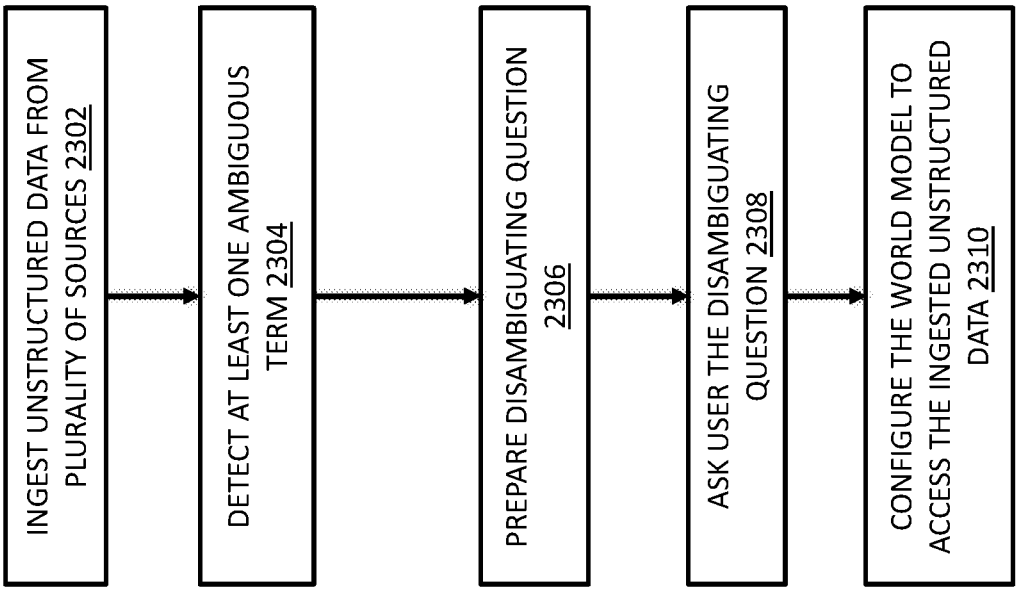
INGEST UNSTRUCTURED DATA FROM PLURALITY OF SOURCES 2302
DETECT AT LEAST ONE AMBIGUOUS TERM 2304
PREPARE DISAMBIGUATING QUESTION 2306
ASK USER THE DISAMBIGUATING QUESTION 2308
CONFIGURE THE WORLD MODEL TO ACCESS THE INGESTED UNSTRUCTURED DATA 2310

FIG 23

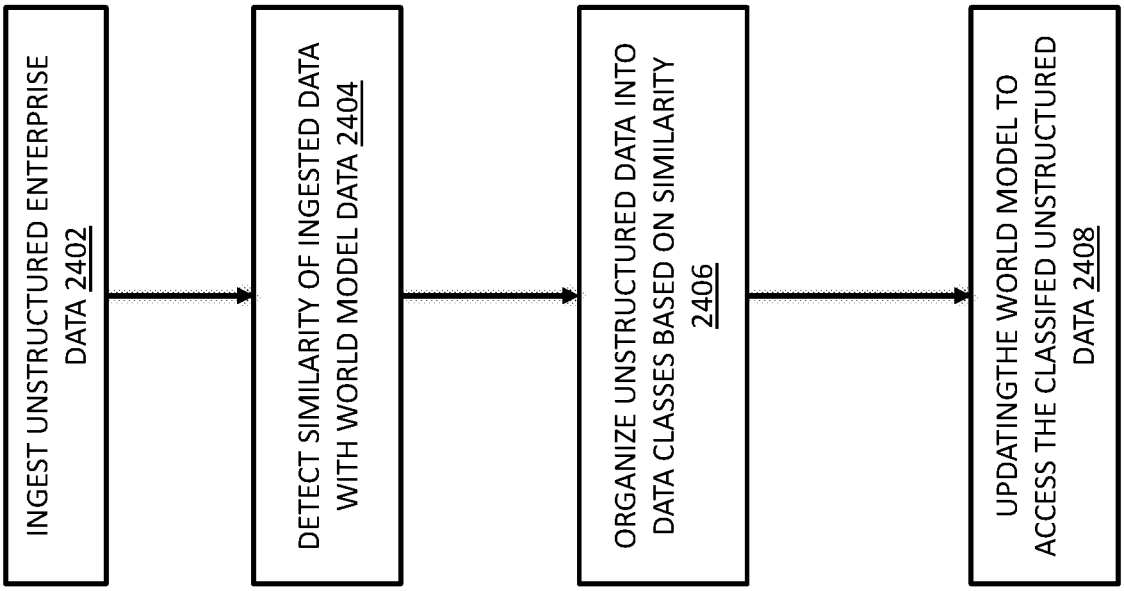
INGEST UNSTRUCTURED ENTERPRISE DATA 2402
DETECT SIMILARITY OF INGESTED DATA WITH WORLD MODEL DATA 2404
ORGANIZE UNSTRUCTURED DATA INTO DATA CLASSES BASED ON SIMILARITY 2406
UPDATINGTHE WORLD MODEL TO ACCESS THE CLASSIFED UNSTRUCTURED DATA 2408

FIG 24

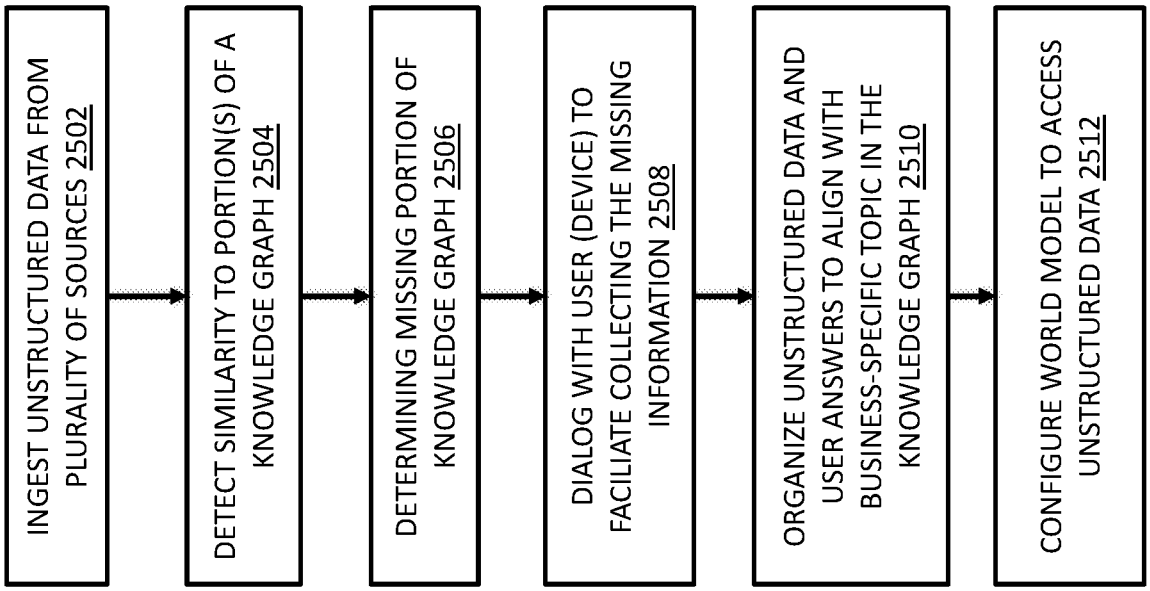
INGEST UNSTRUCTURED DATA FROM PLURALITY OF SOURCES 2502
DETECT SIMILARITY TO PORTION(S) OF A KNOWLEDGE GRAPH 2504
DETERMINING MISSING PORTION OF KNOWLEDGE GRAPH 2506
DIALOG WITH USER (DEVICE) TO FACILIATE COLLECTING THE MISSING INFORMATION 2508
ORGANIZE UNSTRUCTURED DATA AND USER ANSWERS TO ALIGN WITH BUSINESS-SPECIFIC TOPIC IN THE KNOWLEDGE GRAPH 2510
CONFIGURE WORLD MODEL TO ACCESS UNSTRUCTURED DATA 2512

FIG 25

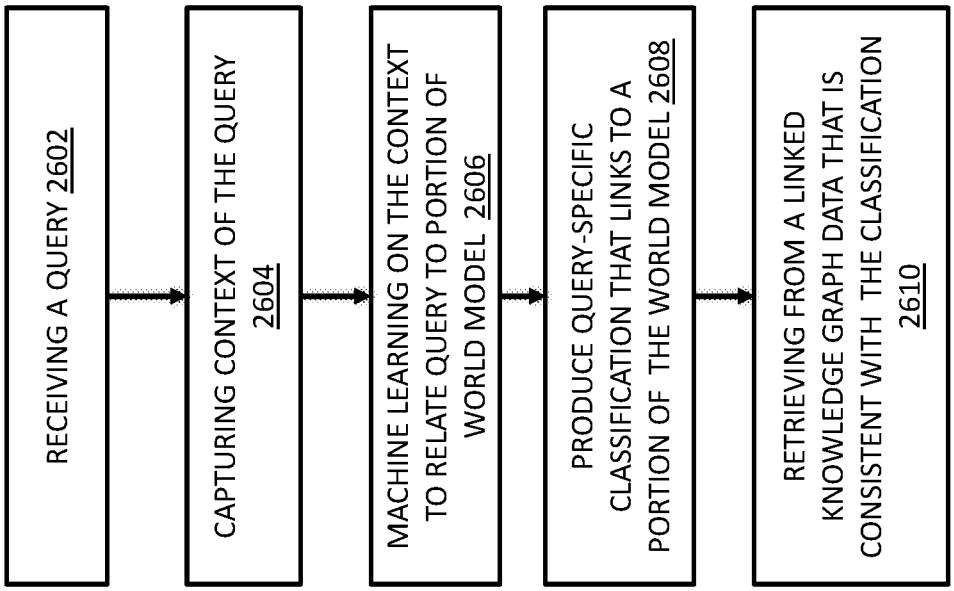
RECEIVING A QUERY 2602
CAPTURING CONTEXT OF THE QUERY 2604
MACHINE LEARNING ON THE CONTEXT TO RELATE QUERY TO PORTION OF WORLD MODEL 2606
PRODUCE QUERY-SPECIFIC CLASSIFICATION THAT LINKS TO A PORTION OF THE WORLD MODEL 2608
RETRIEVING FROM A LINKED KNOWLEDGE GRAPH DATA THAT IS CONSISTENT WITH THE CLASSIFICATION 2610

FIG 26

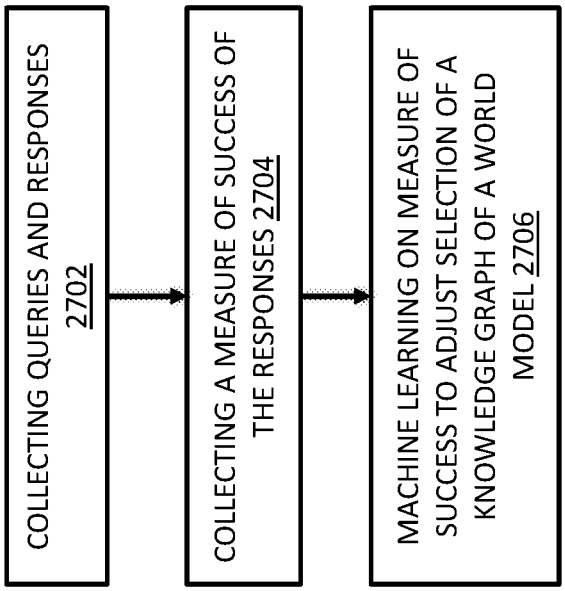
COLLECTING QUERIES AND RESPONSES 2702
COLLECTING A MEASURE OF SUCCESS OF THE RESPONSES 2704
MACHINE LEARNING ON MEASURE OF SUCCESS TO ADJUST SELECTION OF A KNOWLEDGE GRAPH OF A WORLD MODEL 2706

FIG 27

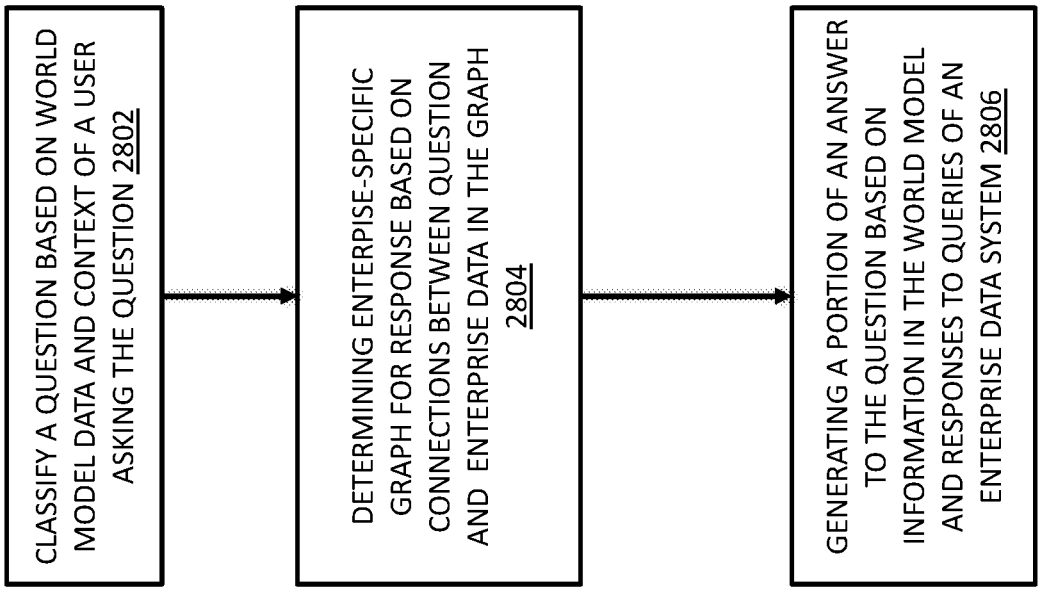
CLASSIFY A QUESTION BASED ON WORLD MODEL DATA AND CONTEXT OF A USER ASKING THE QUESTION 2802
DETERMINING ENTERPISE-SPECIFIC GRAPH FOR RESPONSE BASED ON CONNECTIONS BETWEEN QUESTION AND ENTERPRISE DATA IN THE GRAPH 2804
GENERATING A PORTION OF AN ANSWER TO THE QUESTION BASED ON INFORMATION IN THE WORLD MODEL AND RESPONSES TO QUERIES OF AN ENTERPRISE DATA SYSTEM 2806

FIG 28

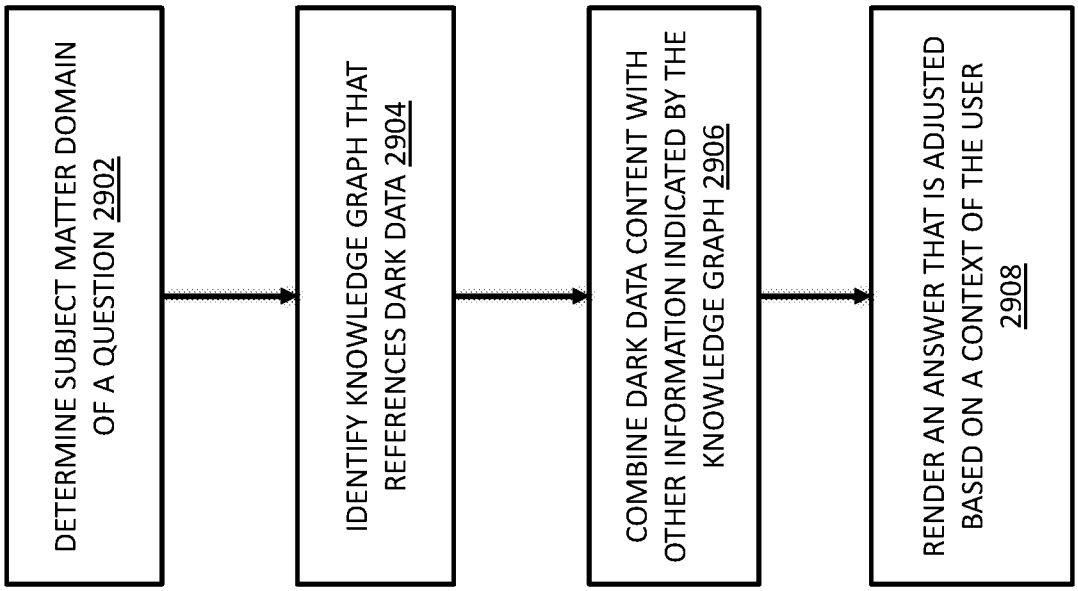
DETERMINE SUBJECT MATTER DOMAIN OF A QUESTION 2902
IDENTIFY KNOWLEDGE GRAPH THAT REFERENCES DARK DATA 2904
COMBINE DARK DATA CONTENT WITH OTHER INFORMATION INDICATED BY THE KNOWLEDGE GRAPH 2906
RENDER AN ANSWER THAT IS ADJUSTED BASED ON A CONTEXT OF THE USER 2908

FIG 29

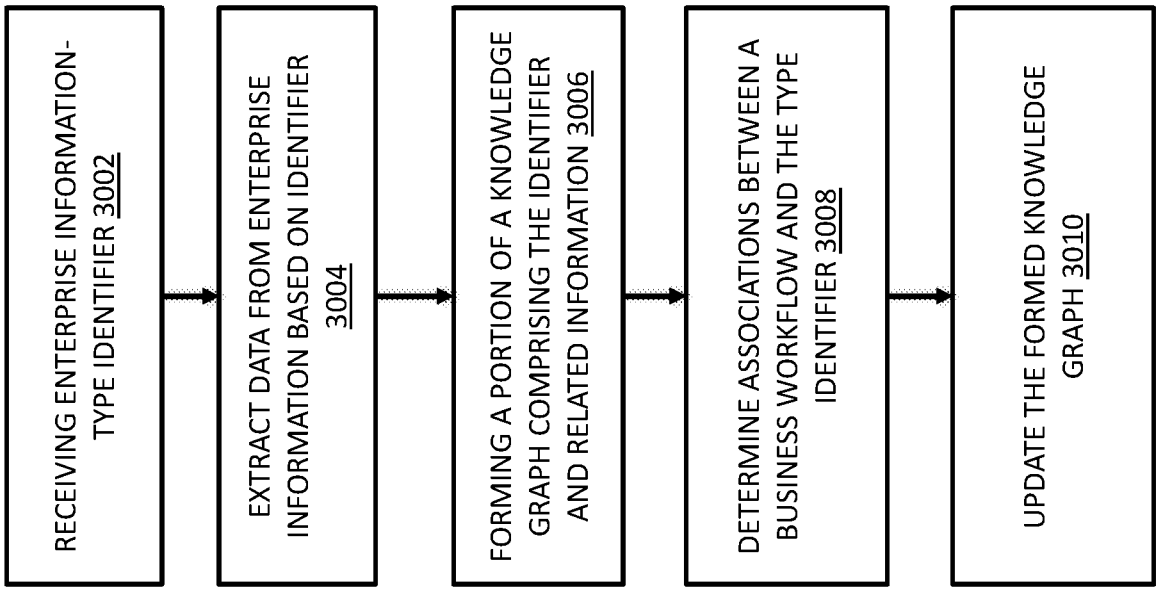
RECEIVING ENTERPRISE INFORMATION-TYPE IDENTIFIER 3002
EXTRACT DATA FROM ENTERPRISE INFORMATION BASED ON IDENTIFIER 3004
FORMING A PORTION OF A KNOWLEDGE GRAPH COMPRISING THE IDENTIFIER AND RELATED INFORMATION 3006
DETERMINE ASSOCIATIONS BETWEEN A BUSINESS WORKFLOW AND THE TYPE IDENTIFIER 3008
UPDATE THE FORMED KNOWLEDGE GRAPH 3010

FIG 30

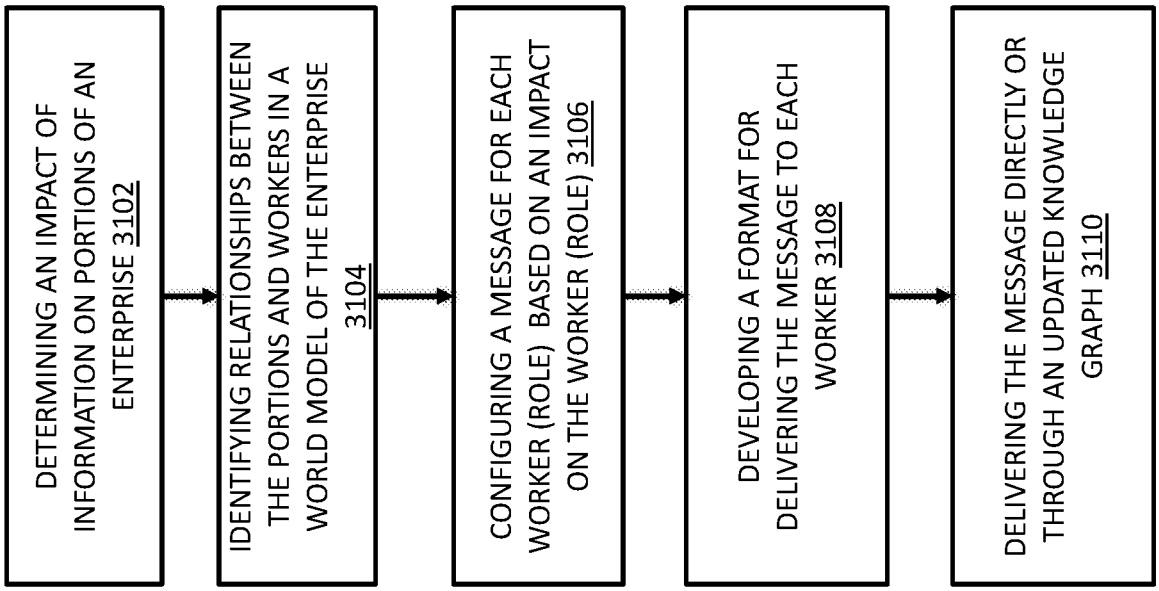
DETERMINING AN IMPACT OF INFORMATION ON PORTIONS OF AN ENTERPRISE 3102
IDENTIFYING RELATIONSHIPS BETWEEN THE PORTIONS AND WORKERS IN A WORLD MODEL OF THE ENTERPRISE 3104
CONFIGURING A MESSAGE FOR EACH WORKER (ROLE) BASED ON AN IMPACT ON THE WORKER (ROLE) 3106
DEVELOPING A FORMAT FOR DELIVERING THE MESSAGE TO EACH WORKER 3108
DELIVERING THE MESSAGE DIRECTLY OR THROUGH AN UPDATED KNOWLEDGE GRAPH 3110

FIG 31

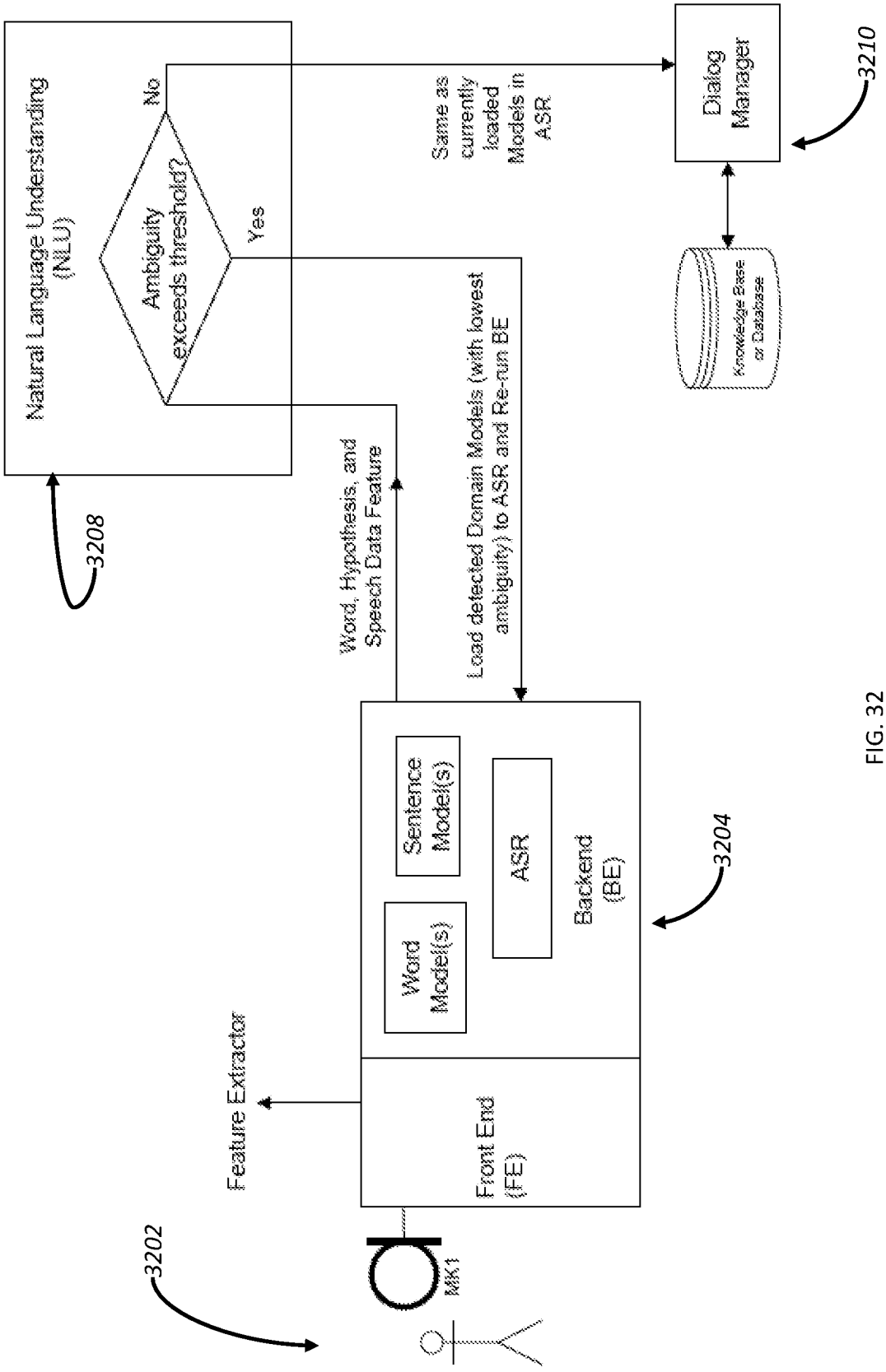
Natural Language Understanding (NLU)
Ambiguity exceeds threshold?
No
Yes
Same as currently loaded Models in ASR
Dialog Manager
3210
Knowledge Base or Database
3208
Word, Hypothesis, and Speech Data Feature
Load detected Domain Models (with lowest ambiguity) to ASR and Re-run BE
Backend (BE)
Sentence Model(s)
ASR
Word Model(s)
3204
Feature Extractor
Front End (FE)
MK1
3202

FIG. 32

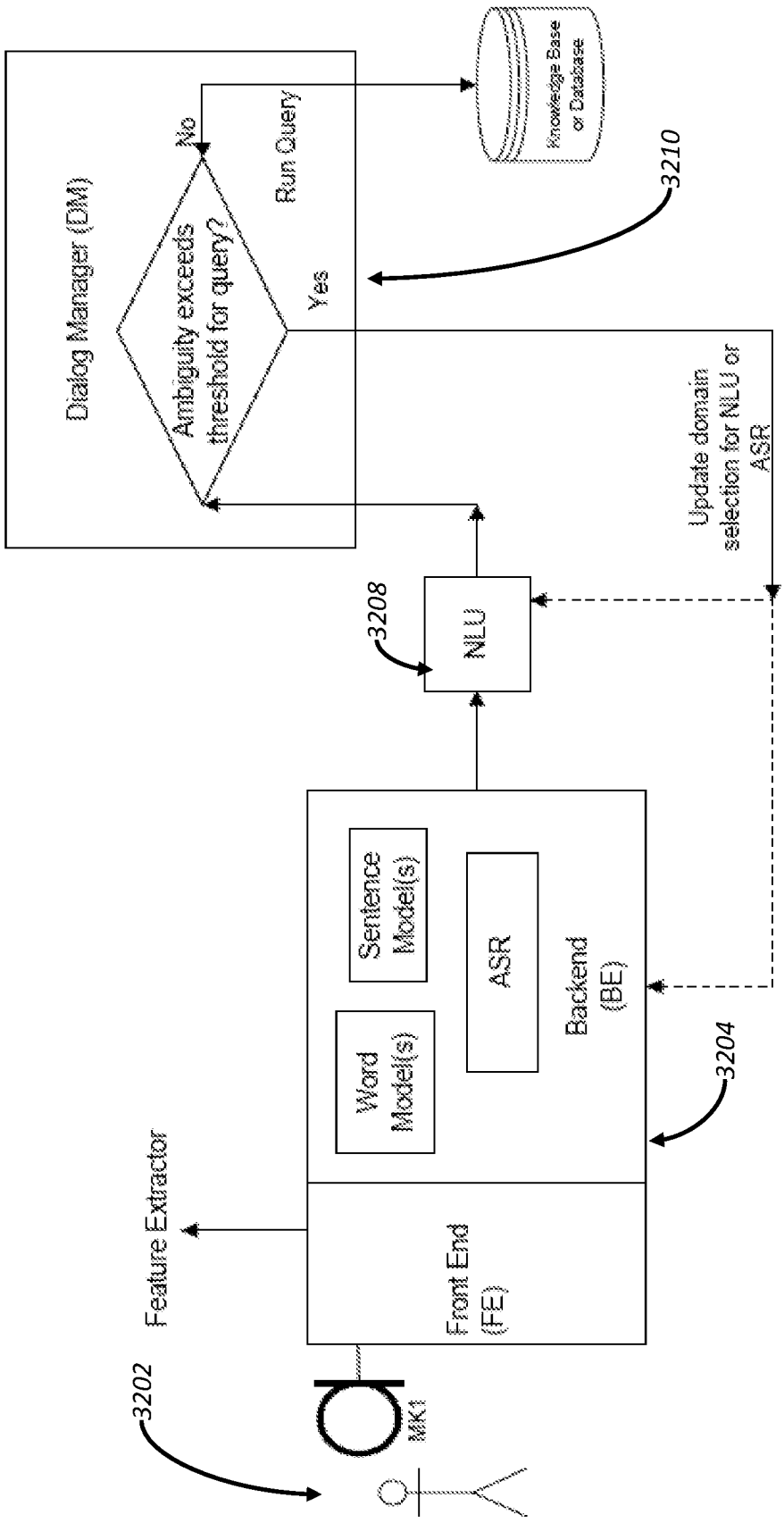
3202
MK1
Front End
(FE)
Feature Extractor
Backend
(BE)
Word
Model(s)
ASR
Sentence
Model(s)
3204
NLU
3208
Update domain
selection for NLU or
ASR
Dialog Manager (DM)
Ambiguity exceeds
threshold for query?
No
Yes
Run Query
Knowledge Base
or Database
3210

FIG. 33

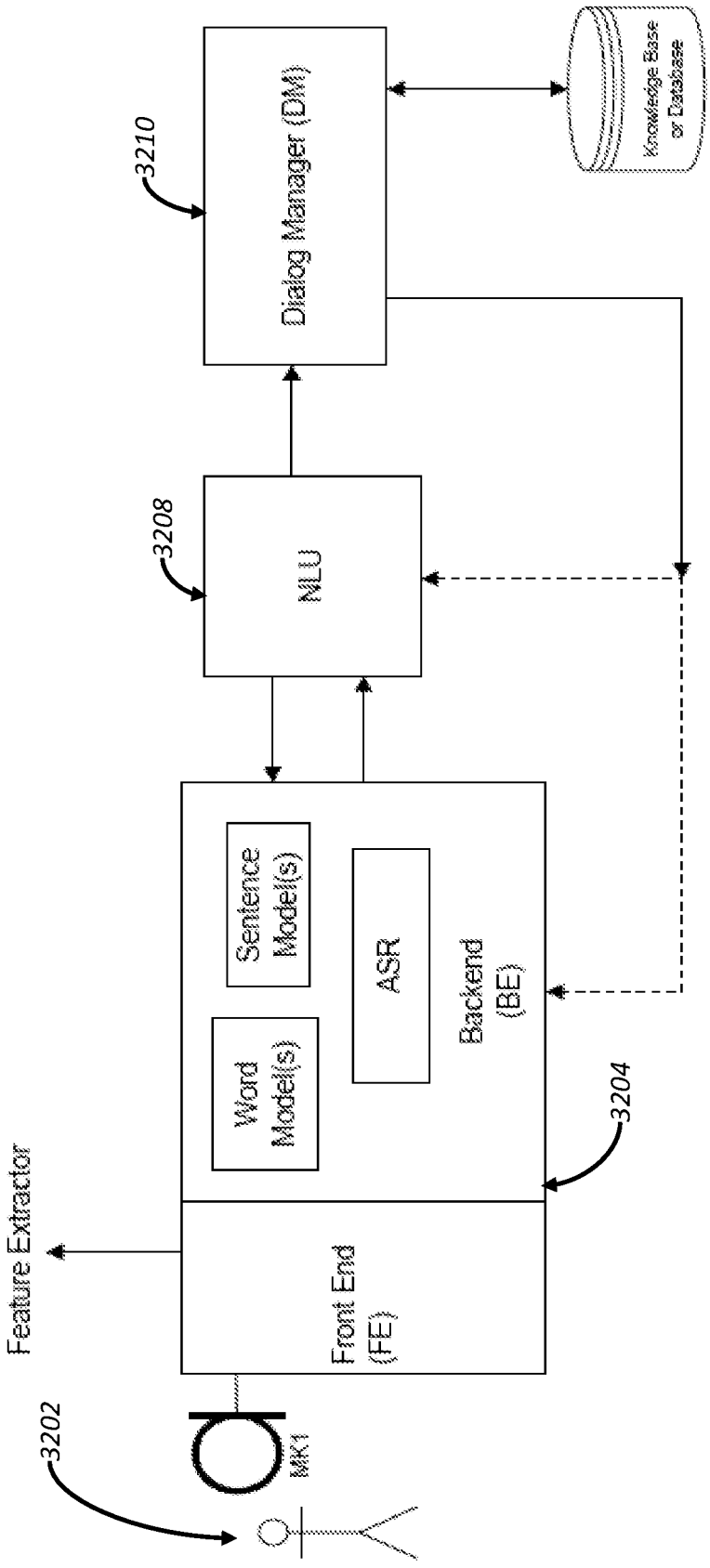
3202
MIK1
Feature Extractor
Front End
(FE)
Backend
(BE)
Word
Model(s)
Sentence
Model(s)
ASR
3204
3208
MLU
3210
Dialog Manager (DM)
Knowledge Base
or Database

FIG. 34