FIG. 1

FIG. 1A FIG. 1B FIG. 1C

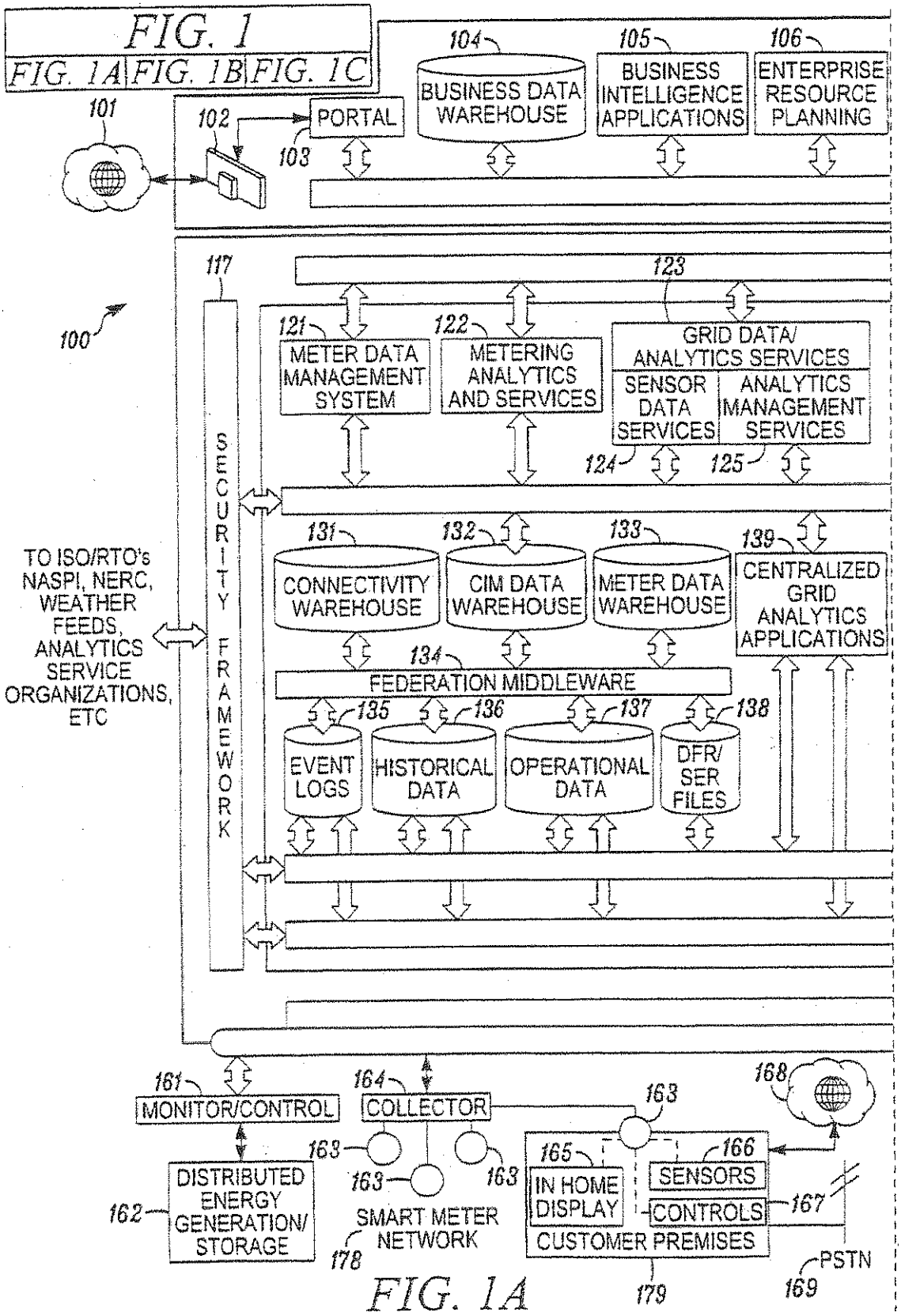


FIG. 1A

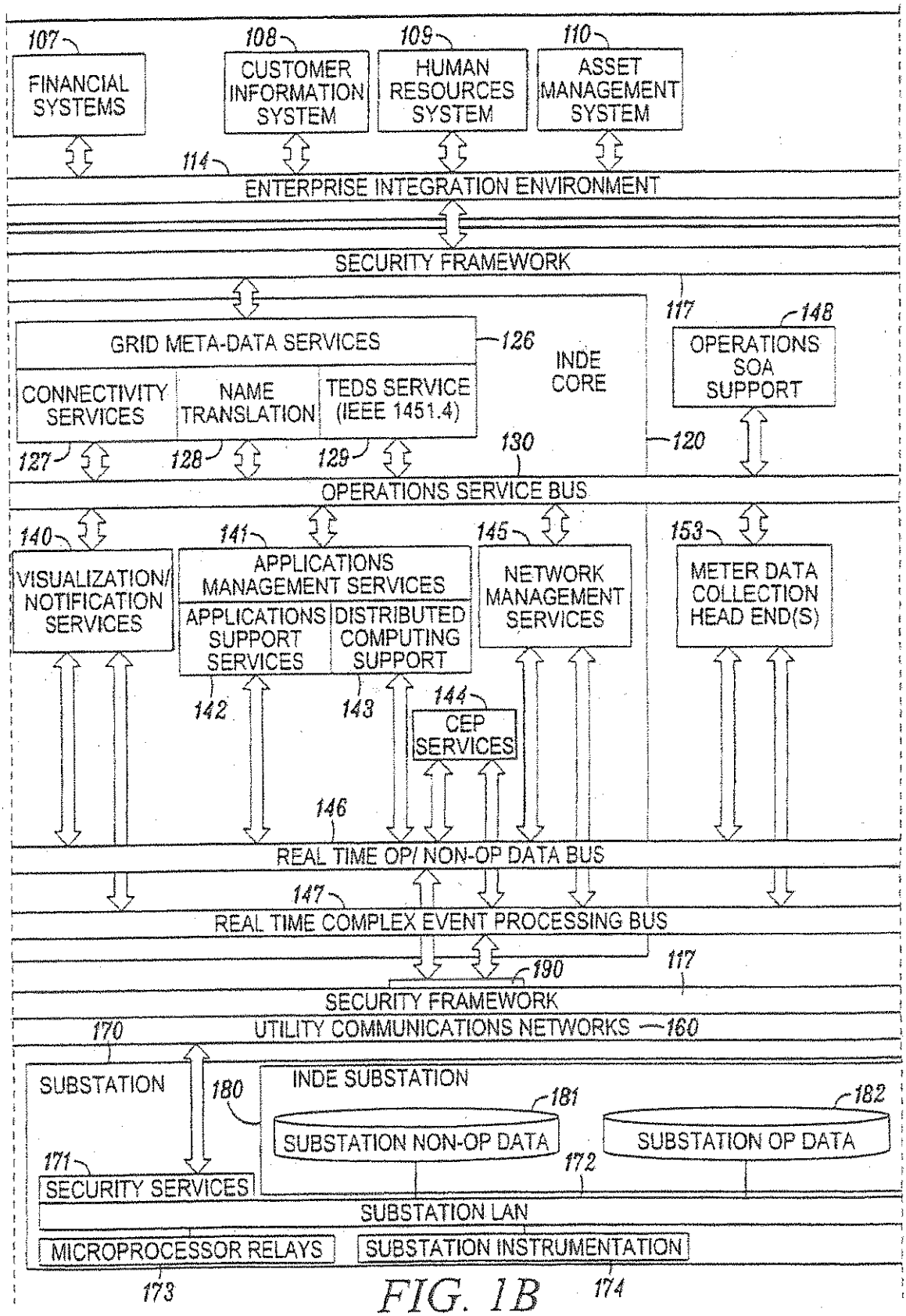

107
FINANCIAL SYSTEMS
108
CUSTOMER INFORMATION SYSTEM
109
HUMAN RESOURCES SYSTEM
110
ASSET MANAGEMENT SYSTEM
114
ENTERPRISE INTEGRATION ENVIRONMENT
SECURITY FRAMEWORK
GRID META-DATA SERVICES
126
CONNECTIVITY SERVICES
NAME TRANSLATION
TEDS SERVICE (IEEE 1451.4)
INDE CORE
117
148
OPERATIONS SOA SUPPORT
127
128
129
130
120
OPERATIONS SERVICE BUS
140
VISUALIZATION/ NOTIFICATION SERVICES
141
APPLICATIONS MANAGEMENT SERVICES
APPLICATIONS SUPPORT SERVICES
DISTRIBUTED COMPUTING SUPPORT
145
NETWORK MANAGEMENT SERVICES
153
METER DATA COLLECTION HEAD END(S)
142
143
144
CEP SERVICES
146
REAL TIME OP/ NON-OP DATA BUS
147
REAL TIME COMPLEX EVENT PROCESSING BUS
190
117
SECURITY FRAMEWORK
170
UTILITY COMMUNICATIONS NETWORKS
160
SUBSTATION
180
INDE SUBSTATION
181
SUBSTATION NON-OP DATA
182
SUBSTATION OP DATA
171
SECURITY SERVICES
172
SUBSTATION LAN
MICROPROCESSOR RELAYS
SUBSTATION INSTRUMENTATION
173
174

FIG. 1B

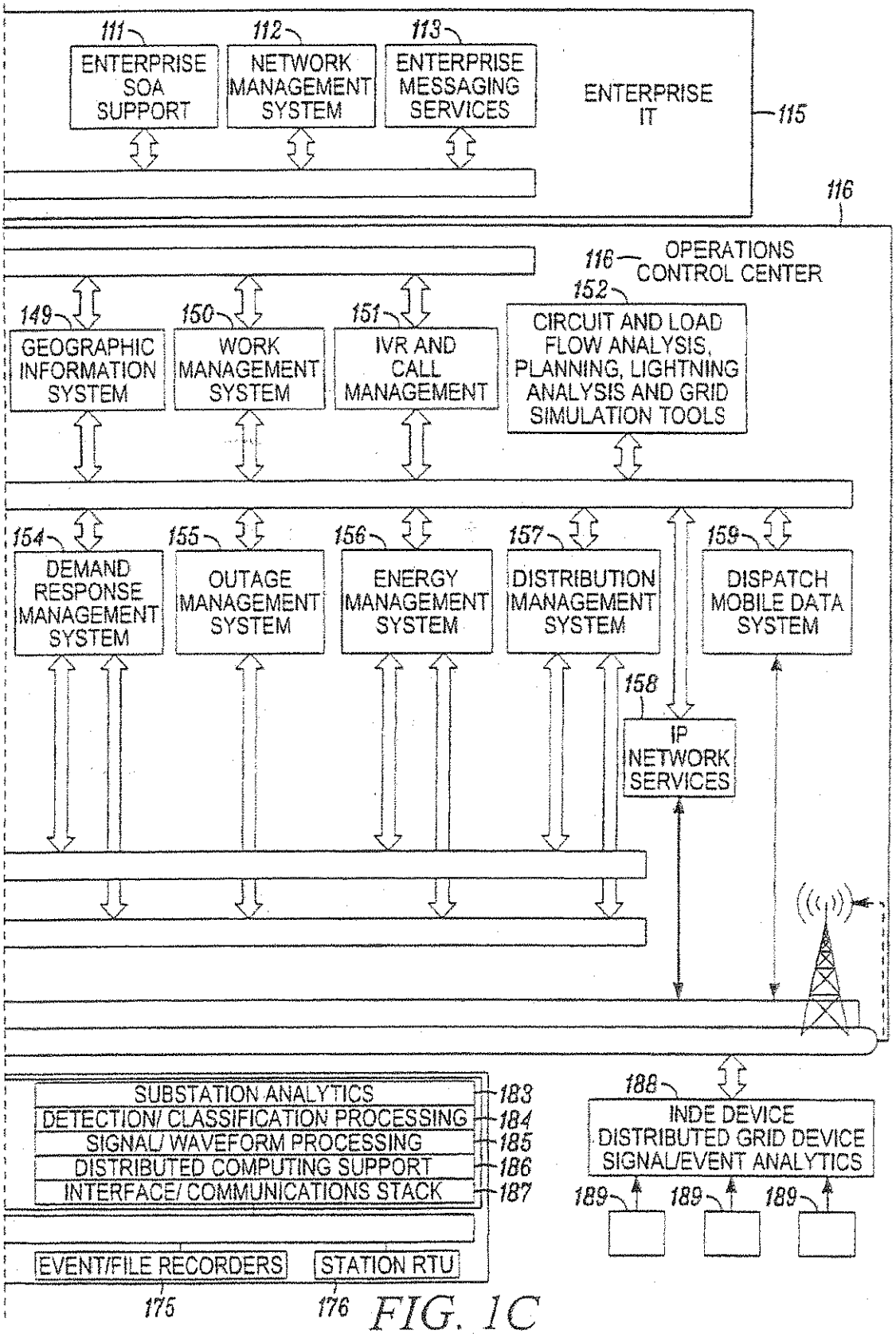

111
ENTERPRISE SOA SUPPORT
112
NETWORK MANAGEMENT SYSTEM
113
ENTERPRISE MESSAGING SERVICES
ENTERPRISE IT
115
116
116 OPERATIONS CONTROL CENTER
152
CIRCUIT AND LOAD FLOW ANALYSIS, PLANNING, LIGHTNING ANALYSIS AND GRID SIMULATION TOOLS
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GEOGRAPHIC INFORMATION SYSTEM
150
WORK MANAGEMENT SYSTEM
151
IVR AND CALL MANAGEMENT
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DEMAND RESPONSE MANAGEMENT SYSTEM
155
OUTAGE MANAGEMENT SYSTEM
156
ENERGY MANAGEMENT SYSTEM
157
DISTRIBUTION MANAGEMENT SYSTEM
159
DISPATCH MOBILE DATA SYSTEM
158
IP NETWORK SERVICES
SUBSTATION ANALYTICS
183
DETECTION/ CLASSIFICATION PROCESSING
184
SIGNAL/ WAVEFORM PROCESSING
185
DISTRIBUTED COMPUTING SUPPORT
186
INTERFACE/ COMMUNICATIONS STACK
187
188
INDE DEVICE DISTRIBUTED GRID DEVICE SIGNAL/EVENT ANALYTICS
189
189
189
EVENT/FILE RECORDERS
175
STATION RTU
176

FIG. 1C

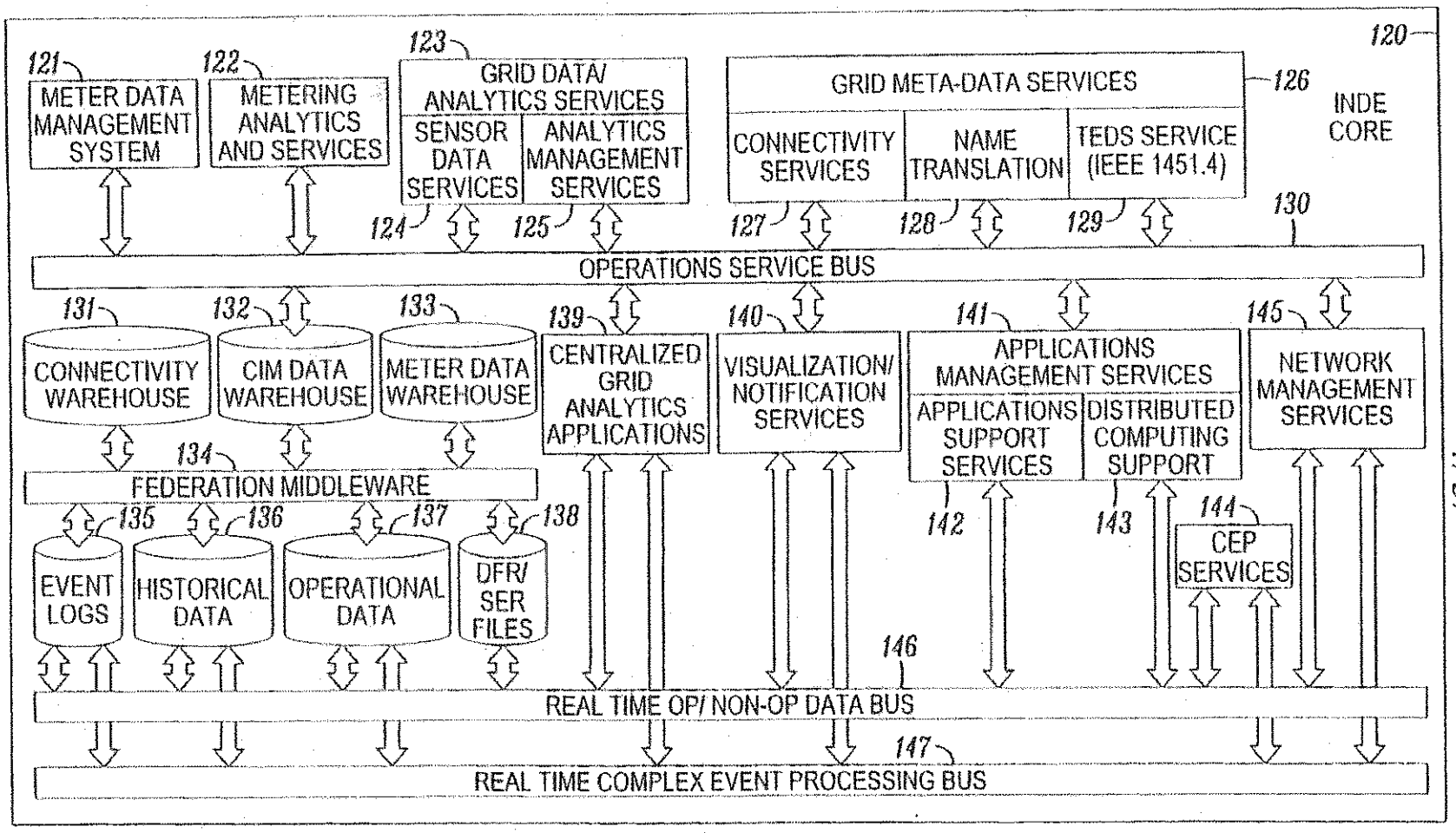

120
121
METER DATA MANAGEMENT SYSTEM
122
METERING ANALYTICS AND SERVICES
123
GRID DATA/ ANALYTICS SERVICES
SENSOR DATA SERVICES
ANALYTICS MANAGEMENT SERVICES
GRID META-DATA SERVICES
126
CONNECTIVITY SERVICES
NAME TRANSLATION
TEDS SERVICE (IEEE 1451.4)
INDE CORE
124
125
127
128
129
130
OPERATIONS SERVICE BUS
131
CONNECTIVITY WAREHOUSE
132
CIM DATA WAREHOUSE
133
METER DATA WAREHOUSE
134
FEDERATION MIDDLEWARE
139
CENTRALIZED GRID ANALYTICS APPLICATIONS
140
VISUALIZATION/ NOTIFICATION SERVICES
141
APPLICATIONS MANAGEMENT SERVICES
APPLICATIONS SUPPORT SERVICES
DISTRIBUTED COMPUTING SUPPORT
145
NETWORK MANAGEMENT SERVICES
135
EVENT LOGS
136
HISTORICAL DATA
137
OPERATIONAL DATA
138
DFR/ SER FILES
142
143
144
CEP SERVICES
146
REAL TIME OP/ NON-OP DATA BUS
147
REAL TIME COMPLEX EVENT PROCESSING BUS

FIG. 2

FIG. 3

FIG. 3A FIG. 3B FIG. 3C

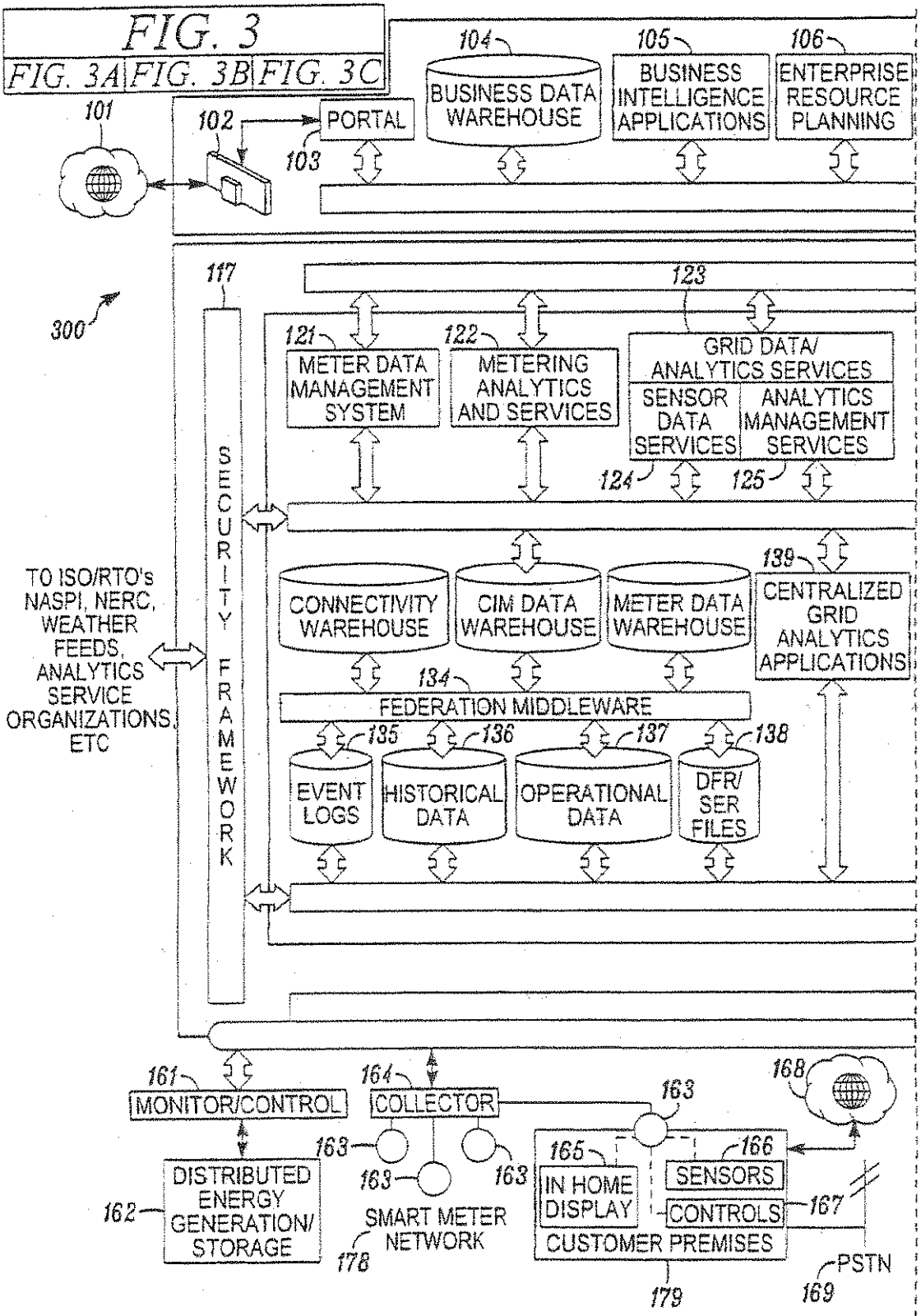


FIG. 3A

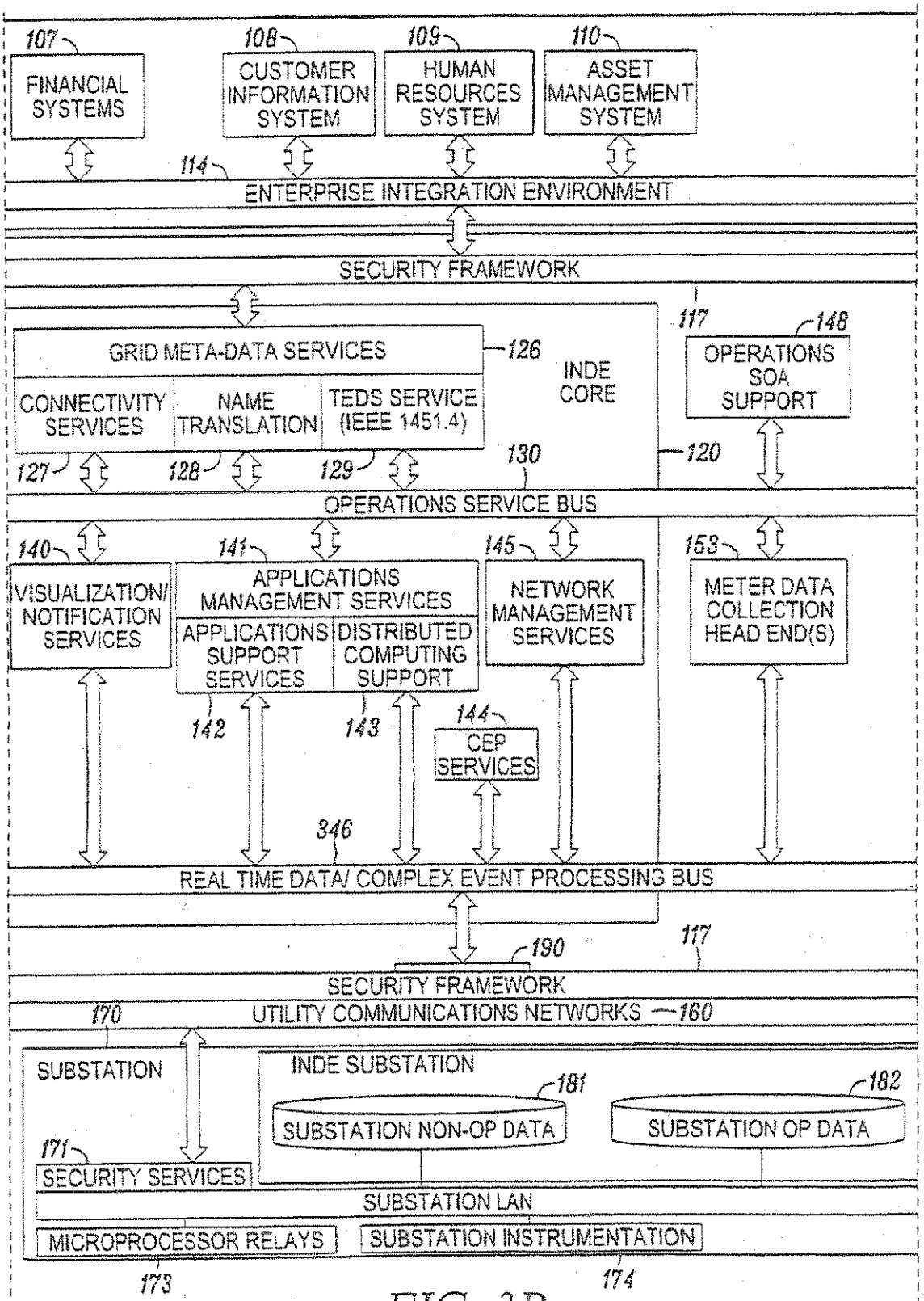

107
FINANCIAL SYSTEMS
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CONNECTIVITY SERVICES
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TEDS SERVICE (IEEE 1451.4)
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128
129
130
120
OPERATIONS SERVICE BUS
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141
145
153
VISUALIZATION/ NOTIFICATION SERVICES
APPLICATIONS MANAGEMENT SERVICES
APPLICATIONS SUPPORT SERVICES
DISTRIBUTED COMPUTING SUPPORT
NETWORK MANAGEMENT SERVICES
METER DATA COLLECTION HEAD END(S)
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CEP SERVICES
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REAL TIME DATA/ COMPLEX EVENT PROCESSING BUS
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INDE SUBSTATION
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SUBSTATION NON-OP DATA
SUBSTATION OP DATA
171
SECURITY SERVICES
SUBSTATION LAN
MICROPROCESSOR RELAYS
SUBSTATION INSTRUMENTATION
173
174

FIG. 3B

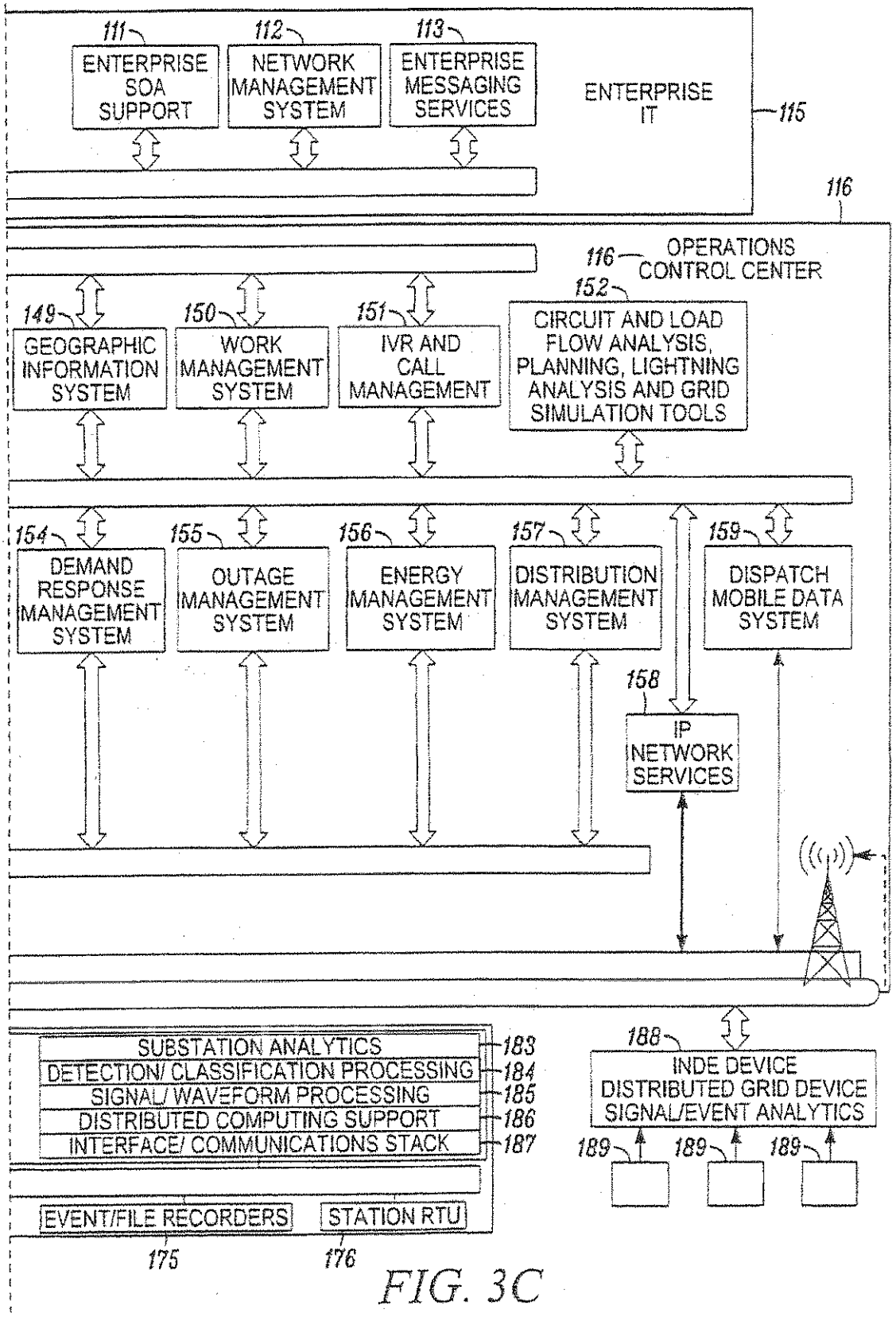

111
ENTERPRISE SOA SUPPORT
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NETWORK MANAGEMENT SYSTEM
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ENTERPRISE MESSAGING SERVICES
ENTERPRISE IT
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WORK MANAGEMENT SYSTEM
151
IVR AND CALL MANAGEMENT
154
DEMAND RESPONSE MANAGEMENT SYSTEM
155
OUTAGE MANAGEMENT SYSTEM
156
ENERGY MANAGEMENT SYSTEM
157
DISTRIBUTION MANAGEMENT SYSTEM
159
DISPATCH MOBILE DATA SYSTEM
158
IP NETWORK SERVICES
SUBSTATION ANALYTICS
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DETECTION/ CLASSIFICATION PROCESSING
184
SIGNAL/ WAVEFORM PROCESSING
185
DISTRIBUTED COMPUTING SUPPORT
186
INTERFACE/ COMMUNICATIONS STACK
187
188
INDE DEVICE DISTRIBUTED GRID DEVICE SIGNAL/EVENT ANALYTICS
189
189
189
EVENT/FILE RECORDERS
175
STATION RTU
176

FIG. 3C

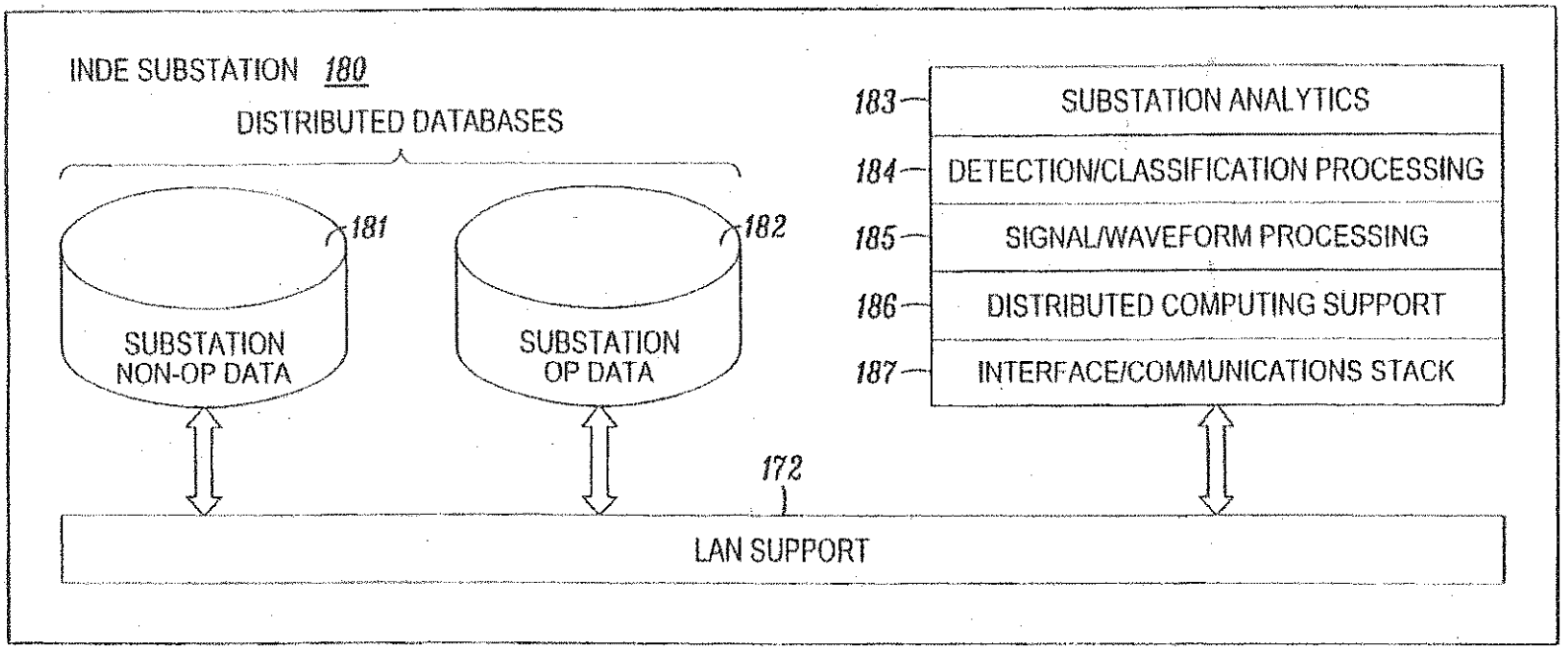

INDE SUBSTATION 180
DISTRIBUTED DATABASES
181
SUBSTATION NON-OP DATA
182
SUBSTATION OP DATA
183
SUBSTATION ANALYTICS
184
DETECTION/CLASSIFICATION PROCESSING
185
SIGNAL/WAVEFORM PROCESSING
186
DISTRIBUTED COMPUTING SUPPORT
187
INTERFACE/COMMUNICATIONS STACK
172
LAN SUPPORT

FIG. 4

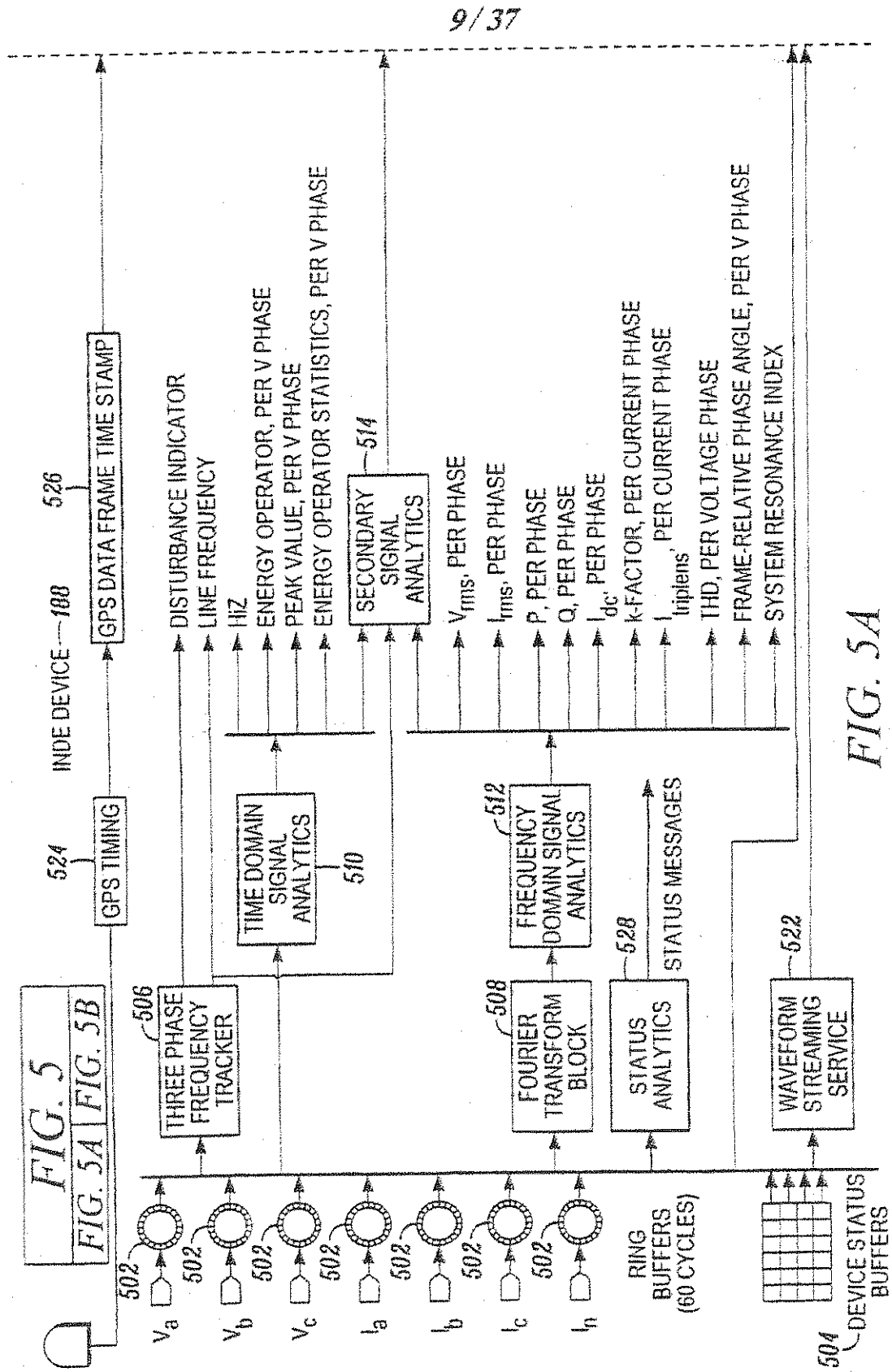

FIG. 5
FIG. 5A FIG. 5B
INDE DEVICE 100
524
526
GPS TIMING
GPS DATA FRAME TIME STAMP
506
THREE PHASE FREQUENCY TRACKER
DISTURBANCE INDICATOR
LINE FREQUENCY
TIME DOMAIN SIGNAL ANALYTICS
510
HIZ
ENERGY OPERATOR, PER V PHASE
PEAK VALUE, PER V PHASE
ENERGY OPERATOR STATISTICS, PER V PHASE
SECONDARY SIGNAL ANALYTICS
514
V_{rms}, PER PHASE
I_{rms}, PER PHASE
P, PER PHASE
Q, PER PHASE
I_{dc}, PER PHASE
k-FACTOR, PER CURRENT PHASE
$I_{triplens}$, PER CURRENT PHASE
THD, PER VOLTAGE PHASE
FRAME-RELATIVE PHASE ANGLE, PER V PHASE
SYSTEM RESONANCE INDEX
512
FREQUENCY DOMAIN SIGNAL ANALYTICS
508
FOURIER TRANSFORM BLOCK
528
STATUS ANALYTICS
STATUS MESSAGES
522
WAVEFORM STREAMING SERVICE
502
V_a
V_b
V_c
I_a
I_b
I_c
I_n
RING BUFFERS (60 CYCLES)
504
DEVICE STATUS BUFFERS

FIG. 5A

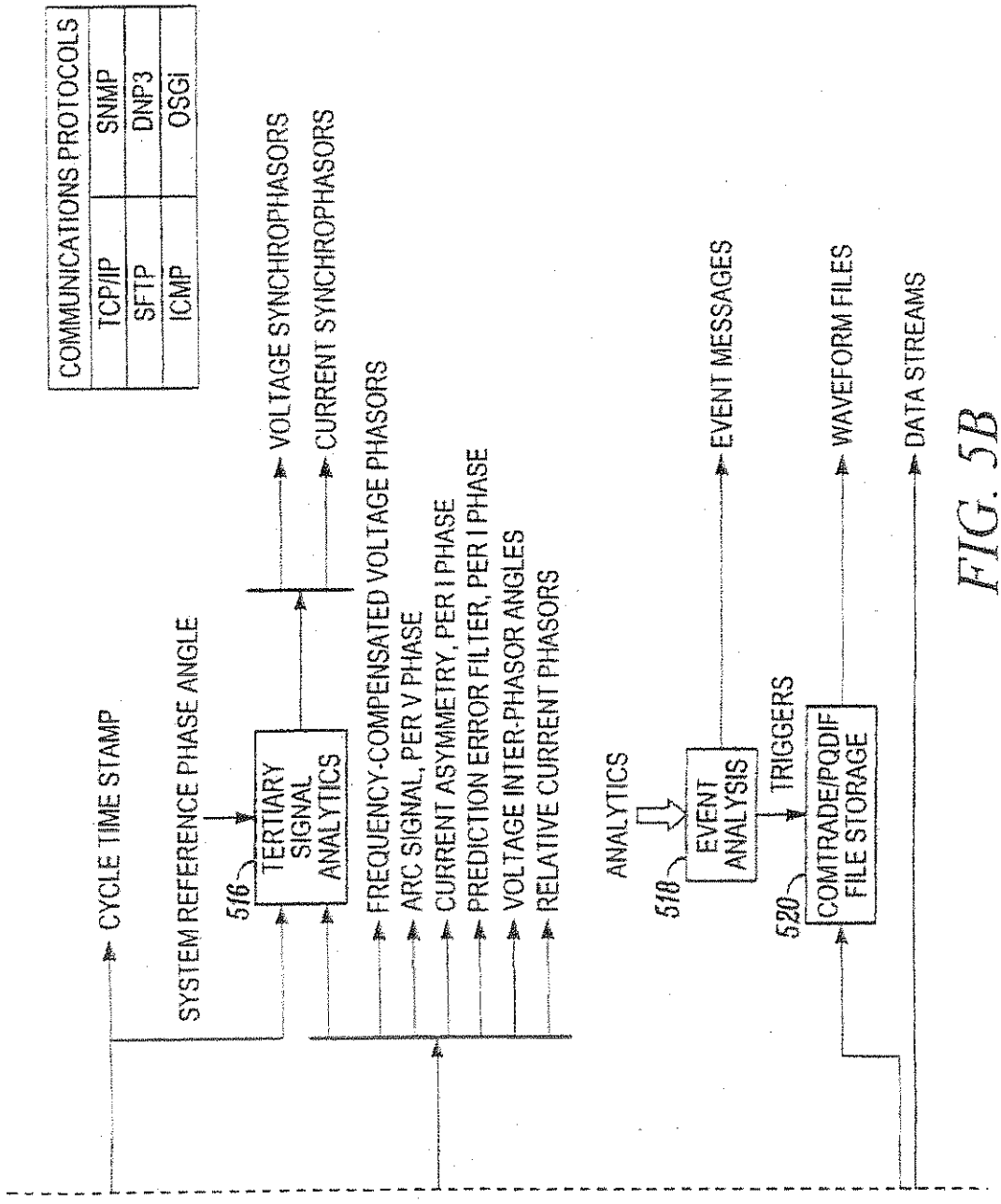

COMMUNICATIONS PROTOCOLS
TCP/IP
SNMP
SFTP
DNP3
ICMP
OSGi
CYCLE TIME STAMP
SYSTEM REFERENCE PHASE ANGLE
516
TERTIARY SIGNAL ANALYTICS
VOLTAGE SYNCHROPHASORS
CURRENT SYNCHROPHASORS
FREQUENCY-COMPENSATED VOLTAGE PHASORS
ARC SIGNAL, PER V PHASE
CURRENT ASYMMETRY, PER I PHASE
PREDICTION ERROR FILTER, PER I PHASE
VOLTAGE INTER-PHASOR ANGLES
RELATIVE CURRENT PHASORS
ANALYTICS
518
EVENT ANALYSIS
EVENT MESSAGES
TRIGGERS
520
COMTRADE/PQDIF FILE STORAGE
WAVEFORM FILES
DATA STREAMS

FIG. 5B

FIG. 6

FIG. 6A FIG. 6B FIG. 6C

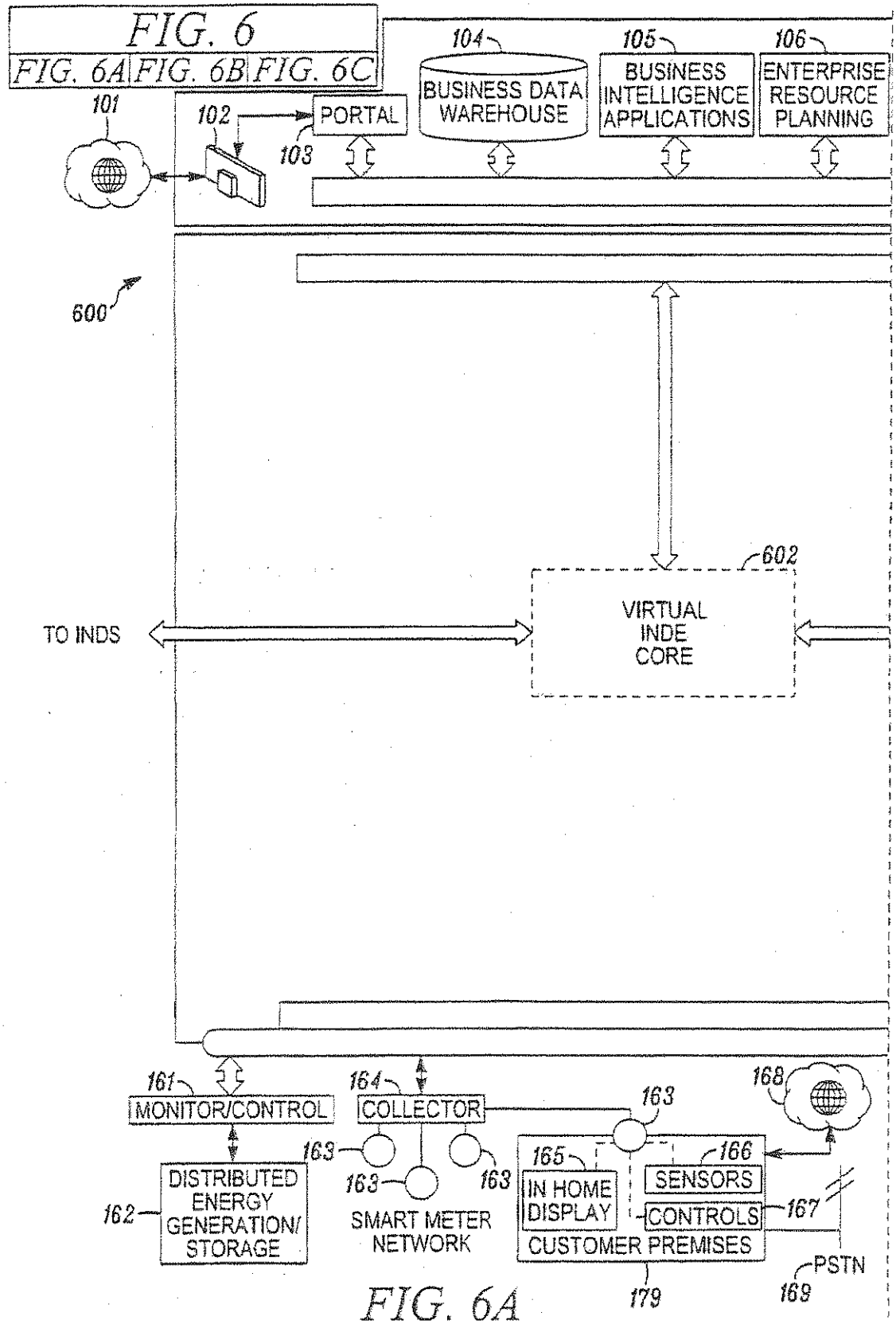


FIG. 6A

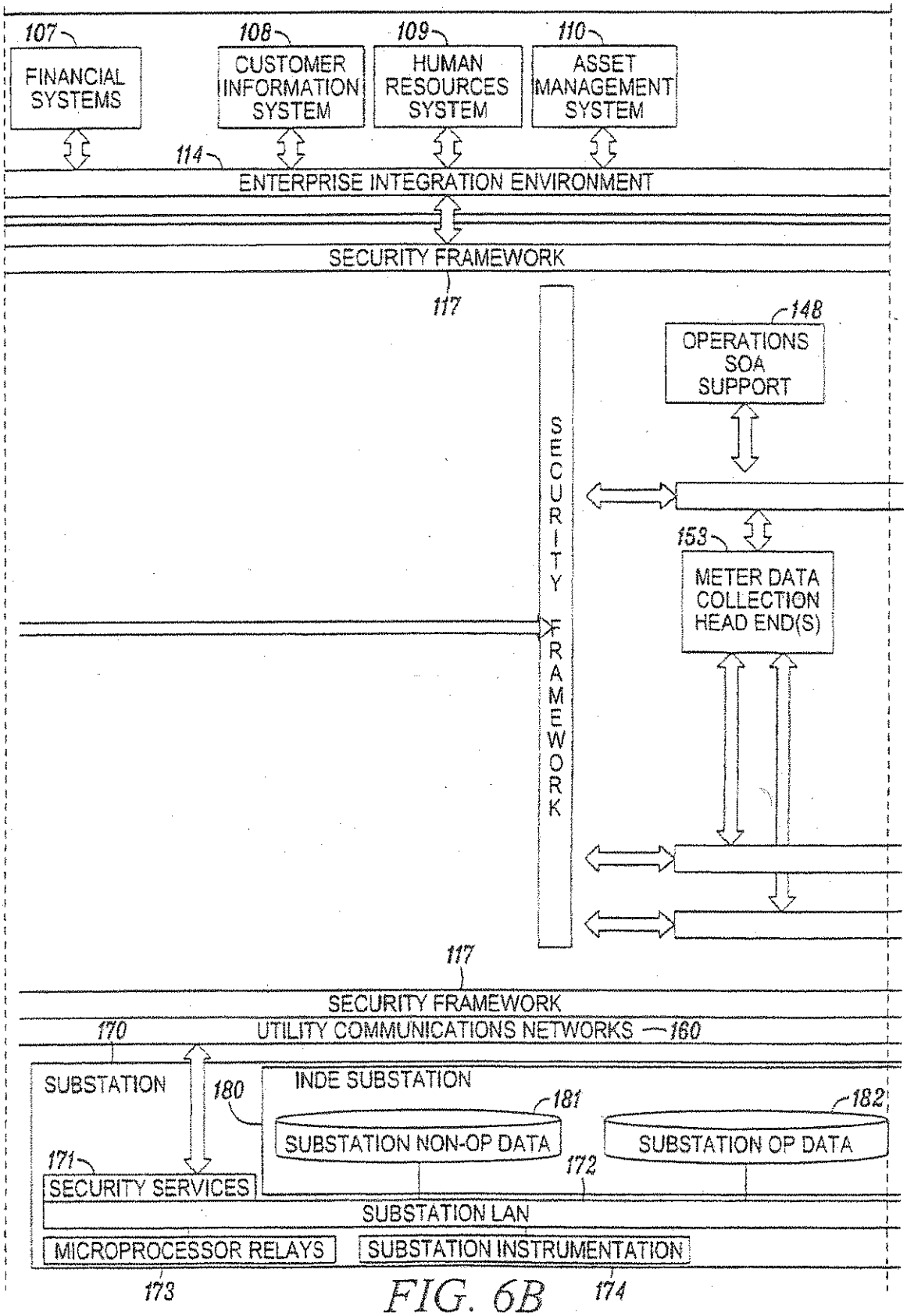

107
FINANCIAL SYSTEMS
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ENTERPRISE INTEGRATION ENVIRONMENT
SECURITY FRAMEWORK
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OPERATIONS SOA SUPPORT
SECURITY FRAMEWORK
153
METER DATA COLLECTION HEAD END(S)
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SECURITY FRAMEWORK
170
UTILITY COMMUNICATIONS NETWORKS 160
SUBSTATION
180
INDE SUBSTATION
181
SUBSTATION NON-OP DATA
182
SUBSTATION OP DATA
171
SECURITY SERVICES
172
SUBSTATION LAN
MICROPROCESSOR RELAYS
SUBSTATION INSTRUMENTATION
173
174

FIG. 6B

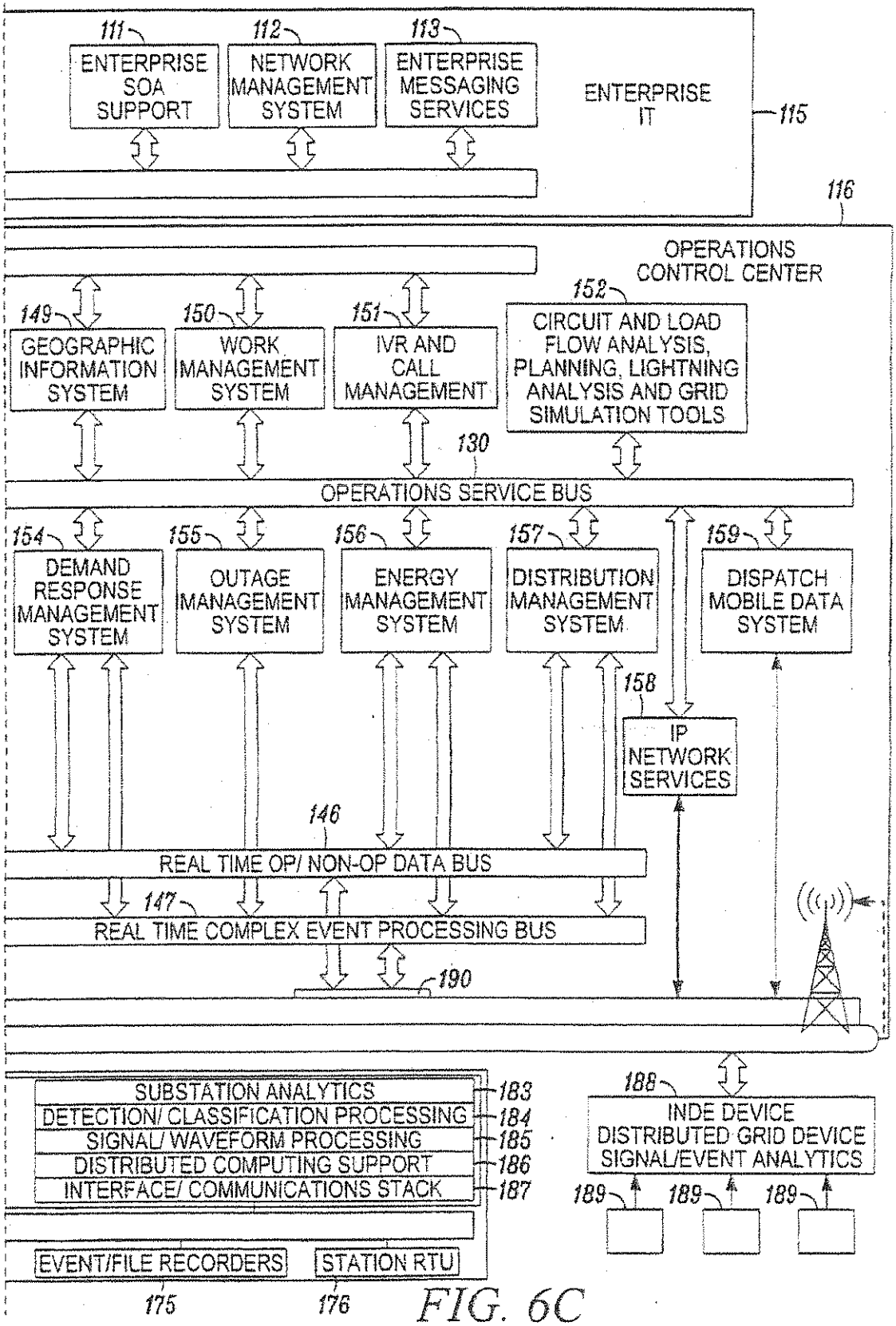

111
ENTERPRISE SOA SUPPORT
112
NETWORK MANAGEMENT SYSTEM
113
ENTERPRISE MESSAGING SERVICES
ENTERPRISE IT
115
116
OPERATIONS CONTROL CENTER
149
GEOGRAPHIC INFORMATION SYSTEM
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WORK MANAGEMENT SYSTEM
151
IVR AND CALL MANAGEMENT
152
CIRCUIT AND LOAD FLOW ANALYSIS, PLANNING, LIGHTNING ANALYSIS AND GRID SIMULATION TOOLS
130
OPERATIONS SERVICE BUS
154
DEMAND RESPONSE MANAGEMENT SYSTEM
155
OUTAGE MANAGEMENT SYSTEM
156
ENERGY MANAGEMENT SYSTEM
157
DISTRIBUTION MANAGEMENT SYSTEM
159
DISPATCH MOBILE DATA SYSTEM
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REAL TIME OP/ NON-OP DATA BUS
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REAL TIME COMPLEX EVENT PROCESSING BUS
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DETECTION/ CLASSIFICATION PROCESSING
184
SIGNAL/ WAVEFORM PROCESSING
185
DISTRIBUTED COMPUTING SUPPORT
186
INTERFACE/ COMMUNICATIONS STACK
187
188
INDE DEVICE DISTRIBUTED GRID DEVICE SIGNAL/EVENT ANALYTICS
189
189
189
EVENT/FILE RECORDERS
175
STATION RTU
176

FIG. 6C

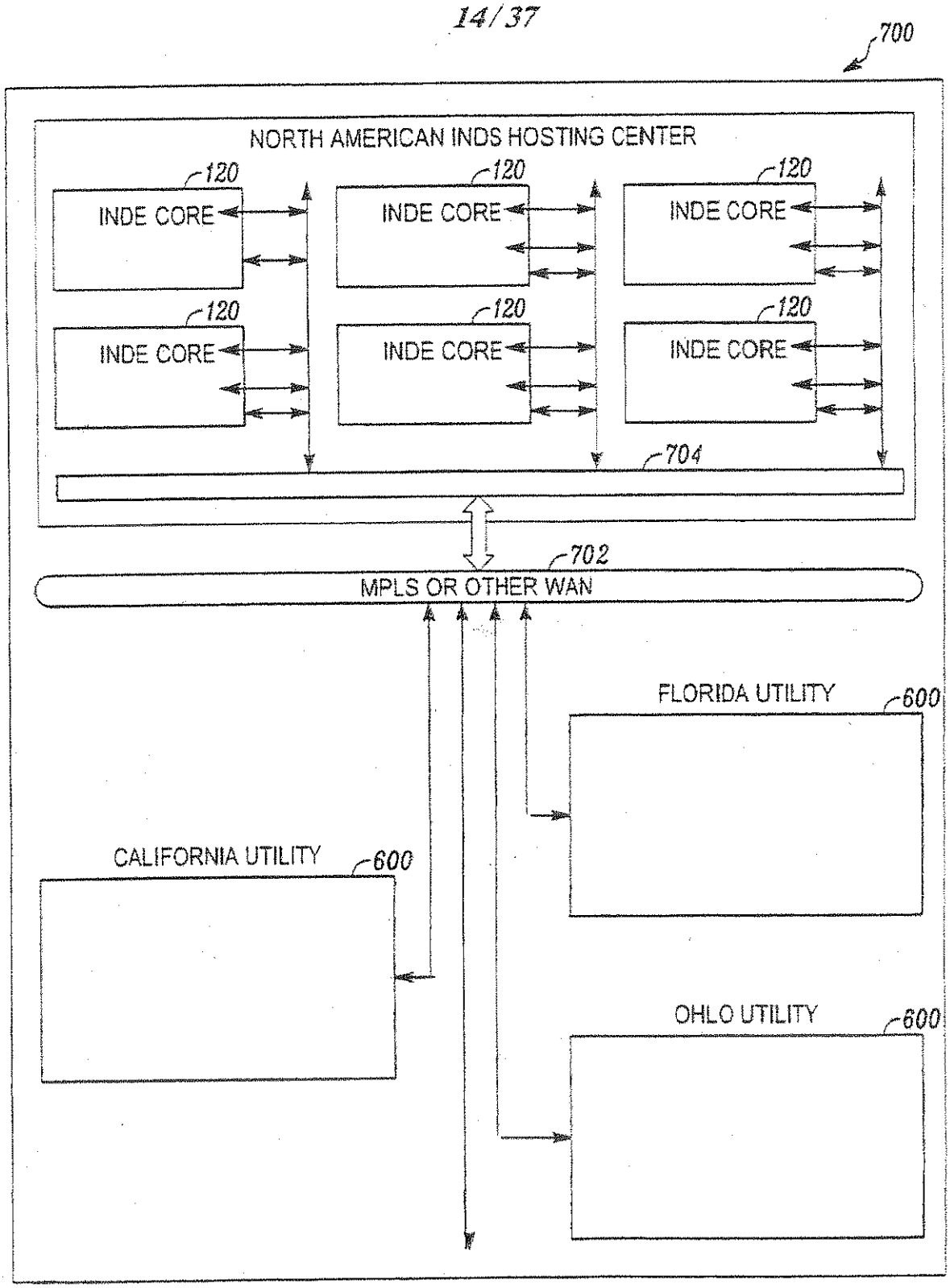

700
NORTH AMERICAN INDS HOSTING CENTER
120
INDE CORE
120
INDE CORE
120
INDE CORE
120
INDE CORE
120
INDE CORE
120
INDE CORE
704
702
MPLS OR OTHER WAN
FLORIDA UTILITY
600
CALIFORNIA UTILITY
600
OHLO UTILITY
600

FIG. 7

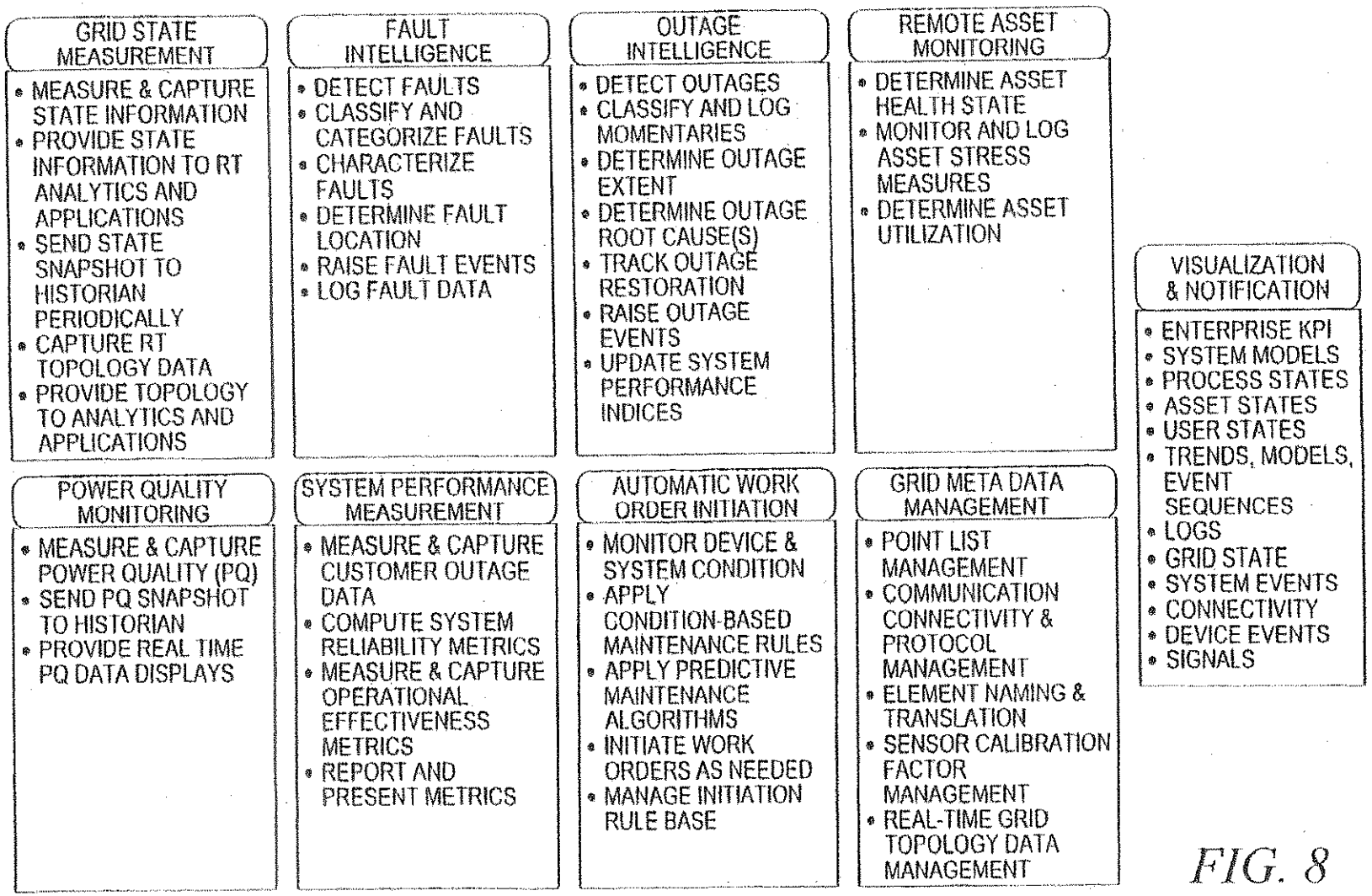

GRID STATE MEASUREMENT
• MEASURE & CAPTURE STATE INFORMATION
• PROVIDE STATE INFORMATION TO RT ANALYTICS AND APPLICATIONS
• SEND STATE SNAPSHOT TO HISTORIAN PERIODICALLY
• CAPTURE RT TOPOLOGY DATA
• PROVIDE TOPOLOGY TO ANALYTICS AND APPLICATIONS
FAULT INTELLIGENCE
• DETECT FAULTS
• CLASSIFY AND CATEGORIZE FAULTS
• CHARACTERIZE FAULTS
• DETERMINE FAULT LOCATION
• RAISE FAULT EVENTS
• LOG FAULT DATA
OUTAGE INTELLIGENCE
• DETECT OUTAGES
• CLASSIFY AND LOG MOMENTARIES
• DETERMINE OUTAGE EXTENT
• DETERMINE OUTAGE ROOT CAUSE(S)
• TRACK OUTAGE RESTORATION
• RAISE OUTAGE EVENTS
• UPDATE SYSTEM PERFORMANCE INDICES
REMOTE ASSET MONITORING
• DETERMINE ASSET HEALTH STATE
• MONITOR AND LOG ASSET STRESS MEASURES
• DETERMINE ASSET UTILIZATION
VISUALIZATION & NOTIFICATION
• ENTERPRISE KPI
• SYSTEM MODELS
• PROCESS STATES
• ASSET STATES
• USER STATES
• TRENDS, MODELS, EVENT SEQUENCES
• LOGS
• GRID STATE
• SYSTEM EVENTS
• CONNECTIVITY
• DEVICE EVENTS
• SIGNALS
POWER QUALITY MONITORING
• MEASURE & CAPTURE POWER QUALITY (PQ)
• SEND PQ SNAPSHOT TO HISTORIAN
• PROVIDE REAL TIME PQ DATA DISPLAYS
SYSTEM PERFORMANCE MEASUREMENT
• MEASURE & CAPTURE CUSTOMER OUTAGE DATA
• COMPUTE SYSTEM RELIABILITY METRICS
• MEASURE & CAPTURE OPERATIONAL EFFECTIVENESS METRICS
• REPORT AND PRESENT METRICS
AUTOMATIC WORK ORDER INITIATION
• MONITOR DEVICE & SYSTEM CONDITION
• APPLY CONDITION-BASED MAINTENANCE RULES
• APPLY PREDICTIVE MAINTENANCE ALGORITHMS
• INITIATE WORK ORDERS AS NEEDED
• MANAGE INITIATION RULE BASE
GRID META DATA MANAGEMENT
• POINT LIST MANAGEMENT
• COMMUNICATION CONNECTIVITY & PROTOCOL MANAGEMENT
• ELEMENT NAMING & TRANSLATION
• SENSOR CALIBRATION FACTOR MANAGEMENT
• REAL-TIME GRID TOPOLOGY DATA MANAGEMENT

FIG. 8

FIG. 9 | FIG. 9A | FIG. 9B

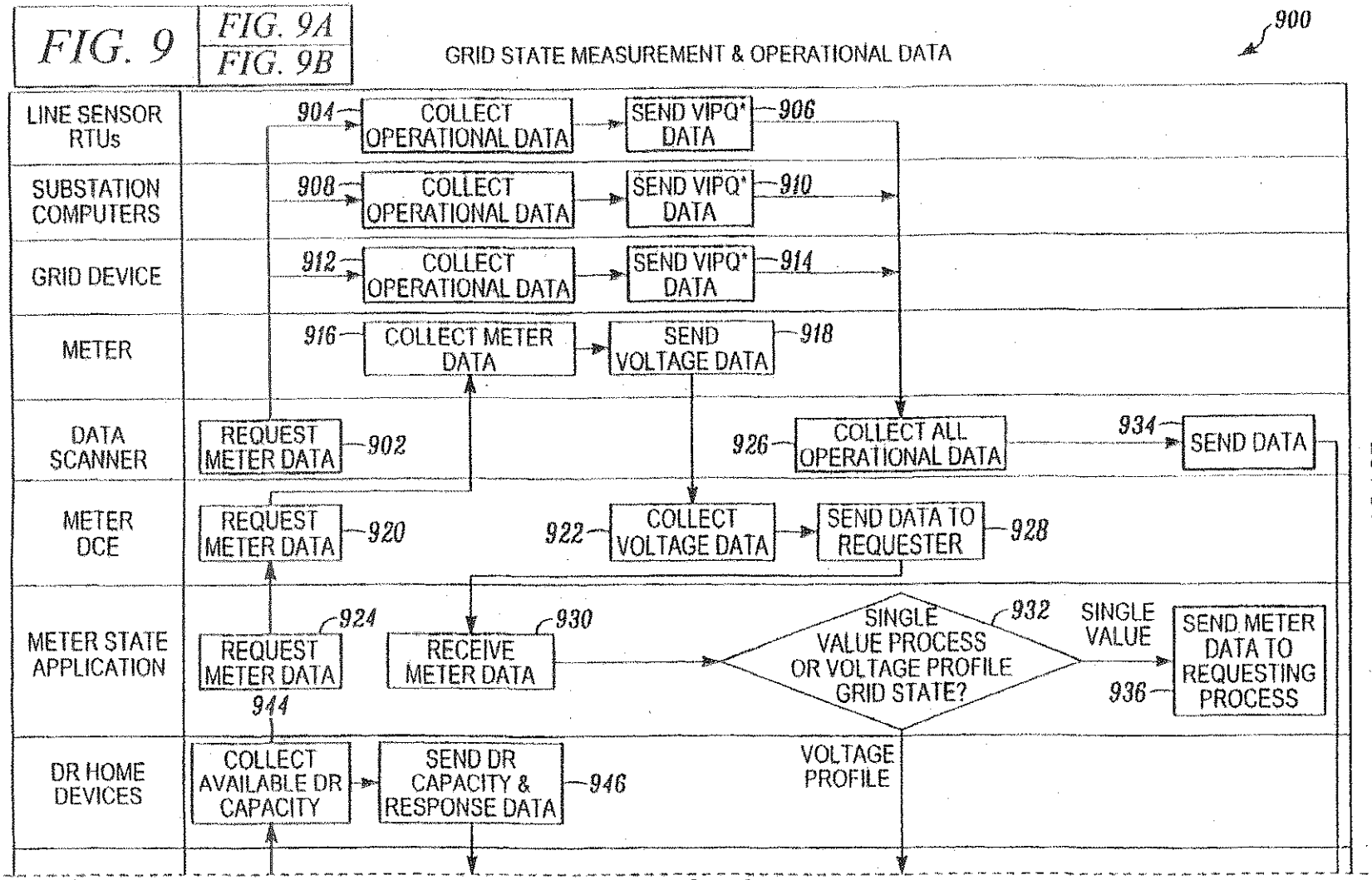
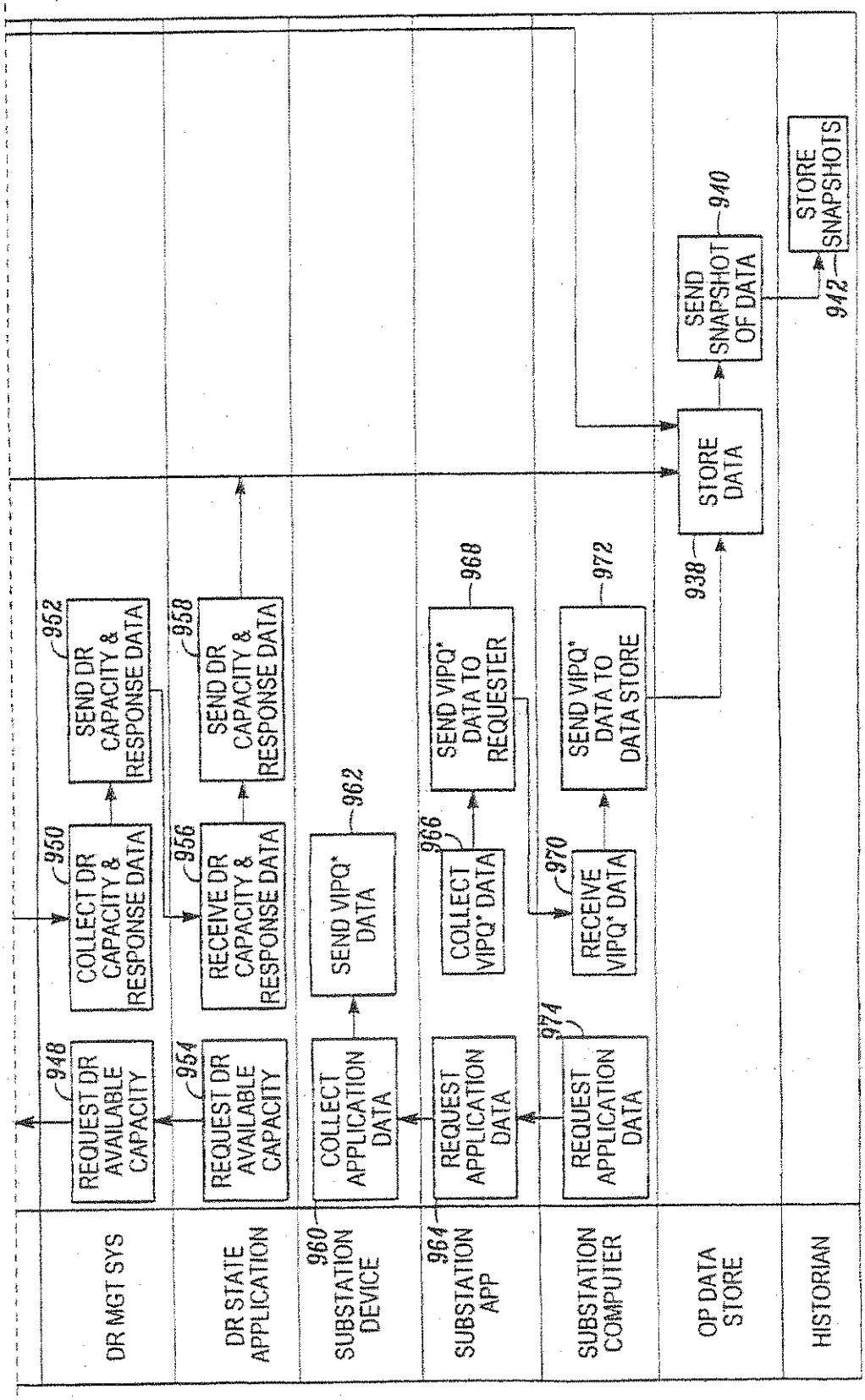


FIG. 9A



* V = VOLTAGE, I = CURRENT, P = REAL POWER, Q = REACTIVE POWER

FIG. 9B

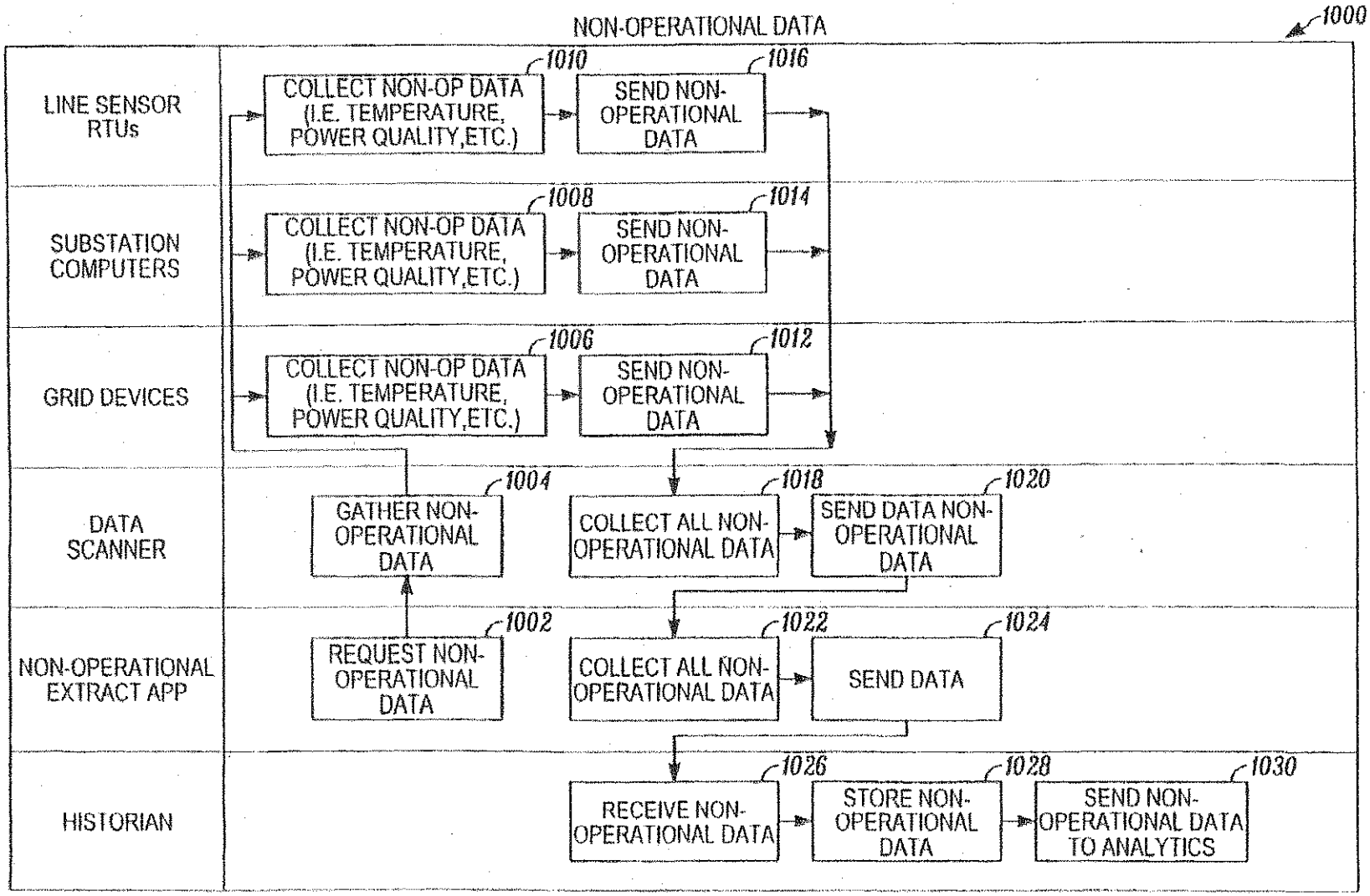

NON-OPERATIONAL DATA
1000
LINE SENSOR RTUs
COLLECT NON-OP DATA (I.E. TEMPERATURE, POWER QUALITY,ETC.)
1010
SEND NON-OPERATIONAL DATA
1016
SUBSTATION COMPUTERS
COLLECT NON-OP DATA (I.E. TEMPERATURE, POWER QUALITY,ETC.)
1008
SEND NON-OPERATIONAL DATA
1014
GRID DEVICES
COLLECT NON-OP DATA (I.E. TEMPERATURE, POWER QUALITY,ETC.)
1006
SEND NON-OPERATIONAL DATA
1012
DATA SCANNER
GATHER NON-OPERATIONAL DATA
1004
COLLECT ALL NON-OPERATIONAL DATA
1018
SEND DATA NON-OPERATIONAL DATA
1020
NON-OPERATIONAL EXTRACT APP
REQUEST NON-OPERATIONAL DATA
1002
COLLECT ALL NON-OPERATIONAL DATA
1022
SEND DATA
1024
HISTORIAN
RECEIVE NON-OPERATIONAL DATA
1026
STORE NON-OPERATIONAL DATA
1028
SEND NON-OPERATIONAL DATA TO ANALYTICS
1030

FIG. 10

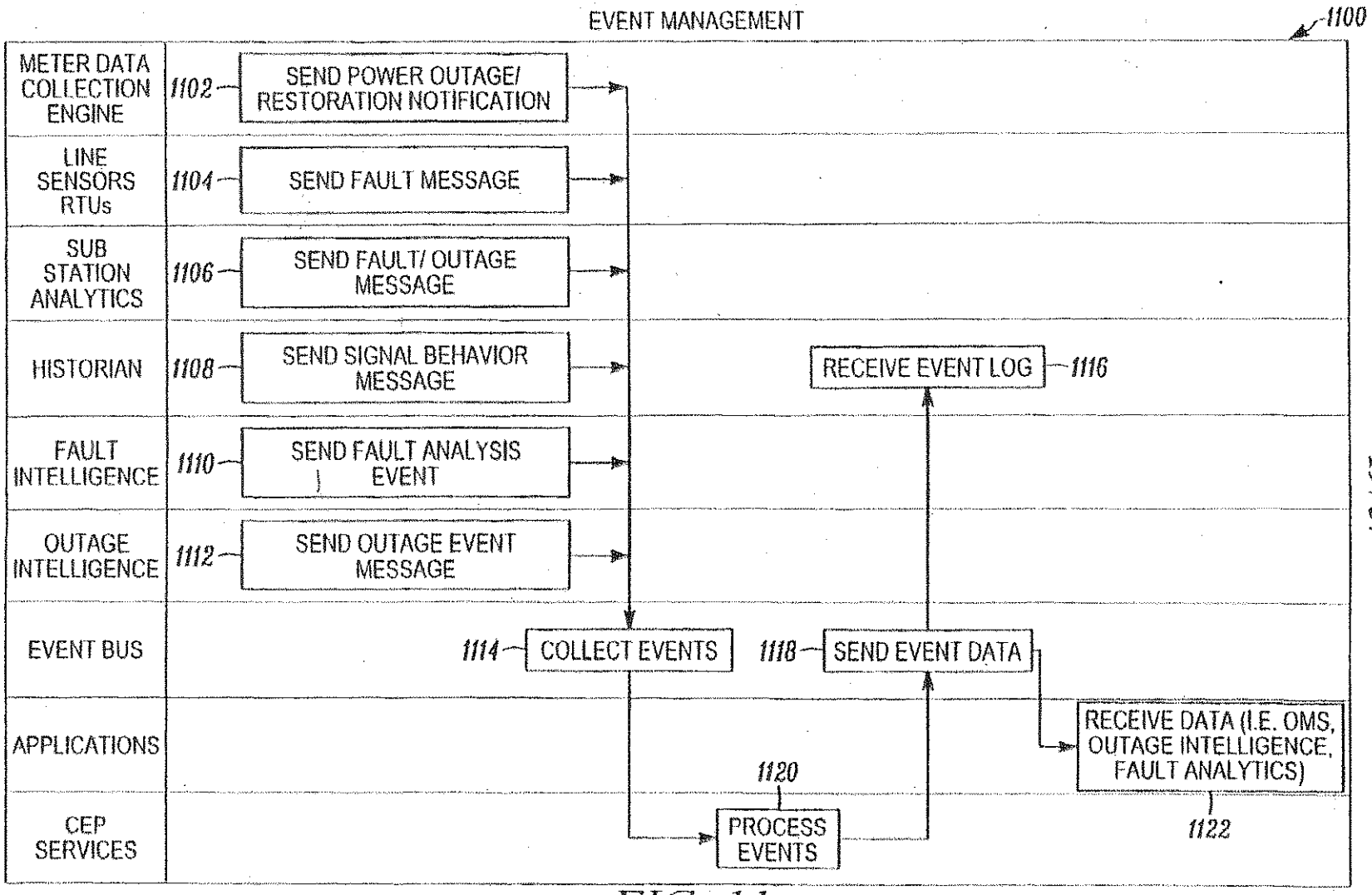

EVENT MANAGEMENT
1100
METER DATA COLLECTION ENGINE
1102
SEND POWER OUTAGE/ RESTORATION NOTIFICATION
LINE SENSORS RTUs
1104
SEND FAULT MESSAGE
SUB STATION ANALYTICS
1106
SEND FAULT/ OUTAGE MESSAGE
HISTORIAN
1108
SEND SIGNAL BEHAVIOR MESSAGE
RECEIVE EVENT LOG
1116
FAULT INTELLIGENCE
1110
SEND FAULT ANALYSIS EVENT
OUTAGE INTELLIGENCE
1112
SEND OUTAGE EVENT MESSAGE
EVENT BUS
1114
COLLECT EVENTS
1118
SEND EVENT DATA
APPLICATIONS
RECEIVE DATA (I.E. OMS, OUTAGE INTELLIGENCE, FAULT ANALYTICS)
1120
CEP SERVICES
PROCESS EVENTS
1122

FIG. 11

FIG. 12

FIG. 12A | FIG. 12B | FIG. 12C

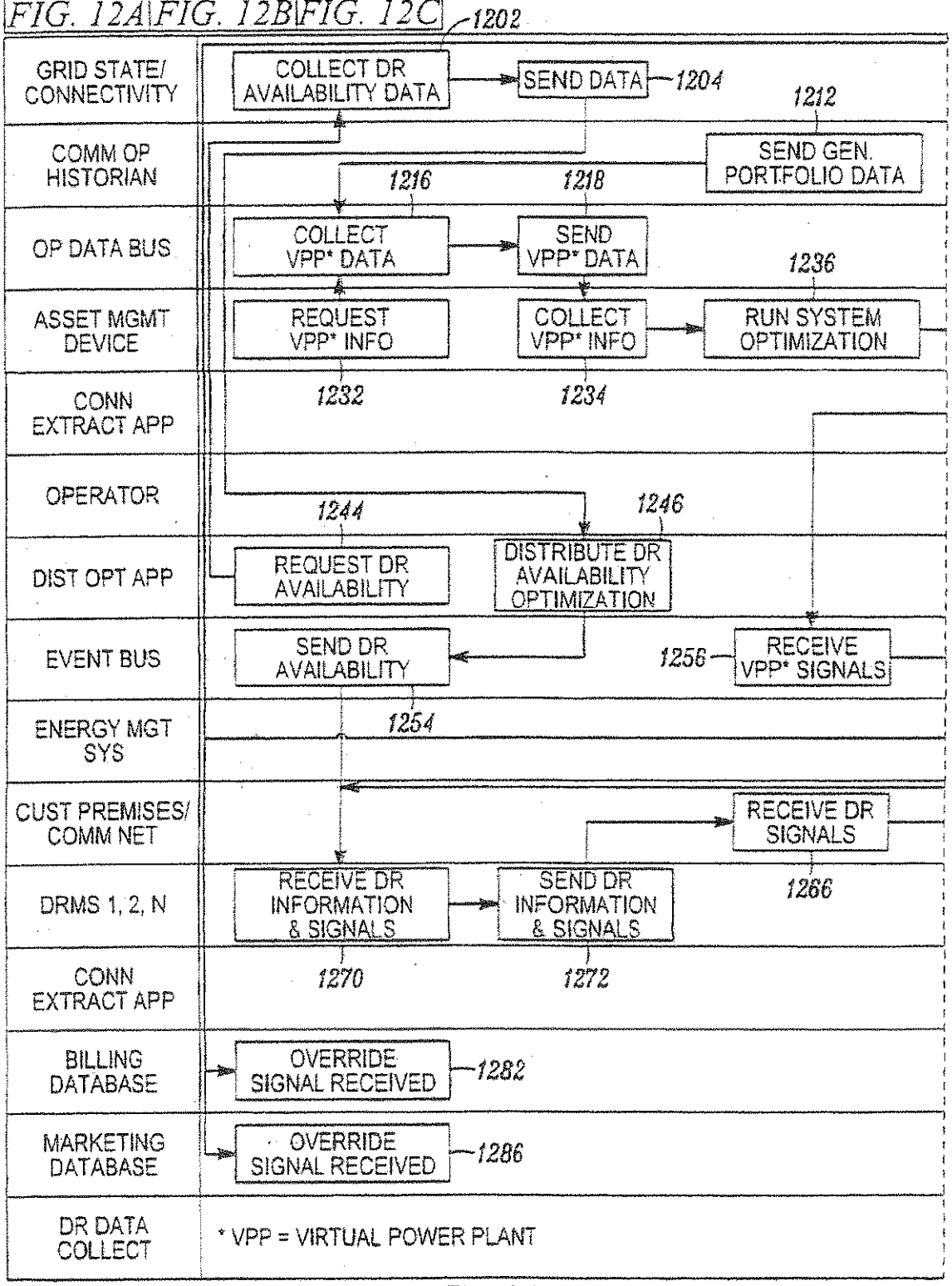


FIG. 12A

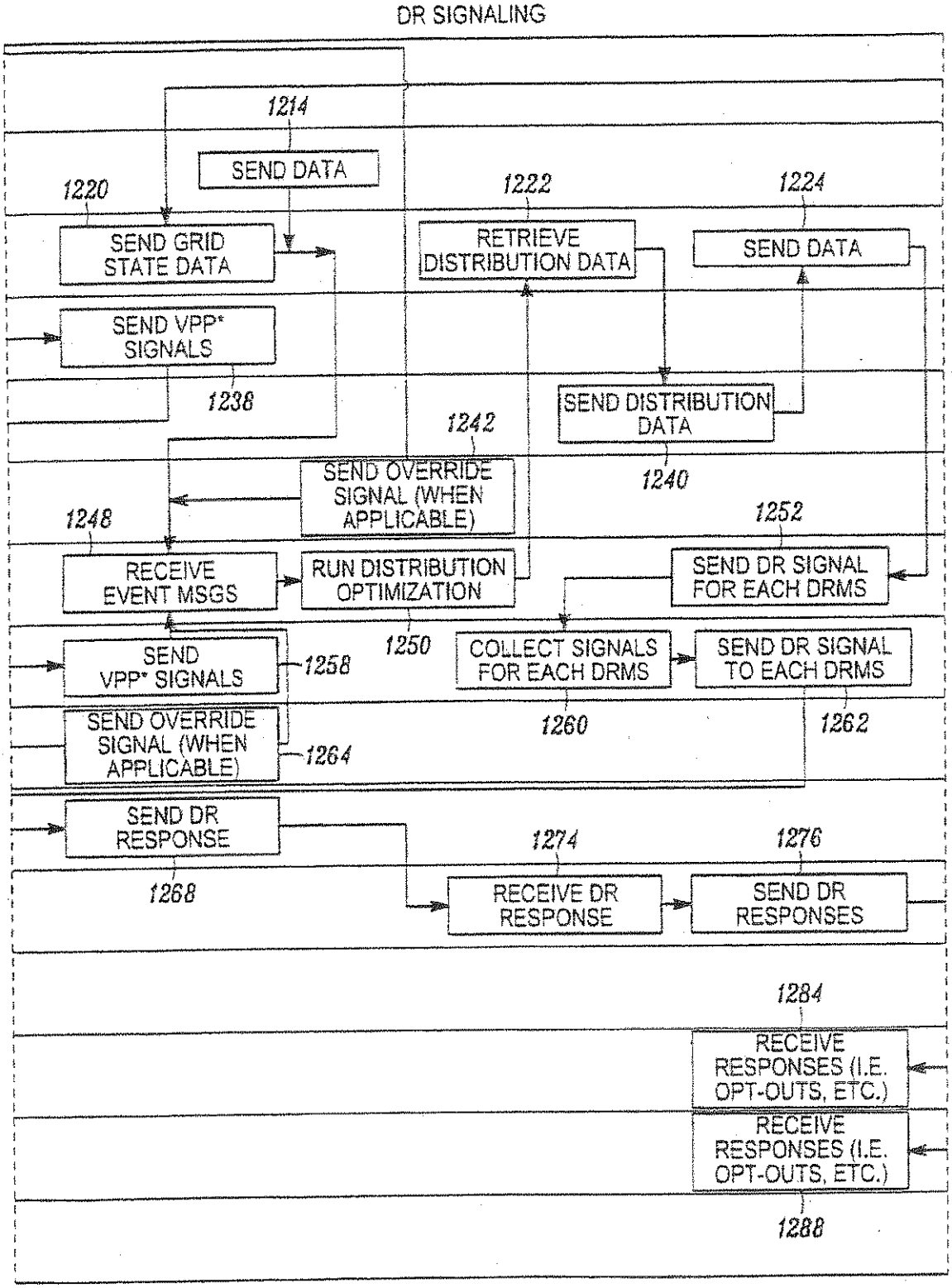

DR SIGNALING
1214
SEND DATA
1220
1222
1224
SEND GRID STATE DATA
RETRIEVE DISTRIBUTION DATA
SEND DATA
SEND VPP* SIGNALS
1238
SEND DISTRIBUTION DATA
1242
1240
SEND OVERRIDE SIGNAL (WHEN APPLICABLE)
1248
1252
RECEIVE EVENT MSGS
RUN DISTRIBUTION OPTIMIZATION
SEND DR SIGNAL FOR EACH DRMS
1250
SEND VPP* SIGNALS
1258
COLLECT SIGNALS FOR EACH DRMS
SEND DR SIGNAL TO EACH DRMS
1260
1262
SEND OVERRIDE SIGNAL (WHEN APPLICABLE)
1264
SEND DR RESPONSE
1274
1276
1268
RECEIVE DR RESPONSE
SEND DR RESPONSES
1284
RECEIVE RESPONSES (I.E. OPT-OUTS, ETC.)
RECEIVE RESPONSES (I.E. OPT-OUTS, ETC.)
1288

FIG. 12B

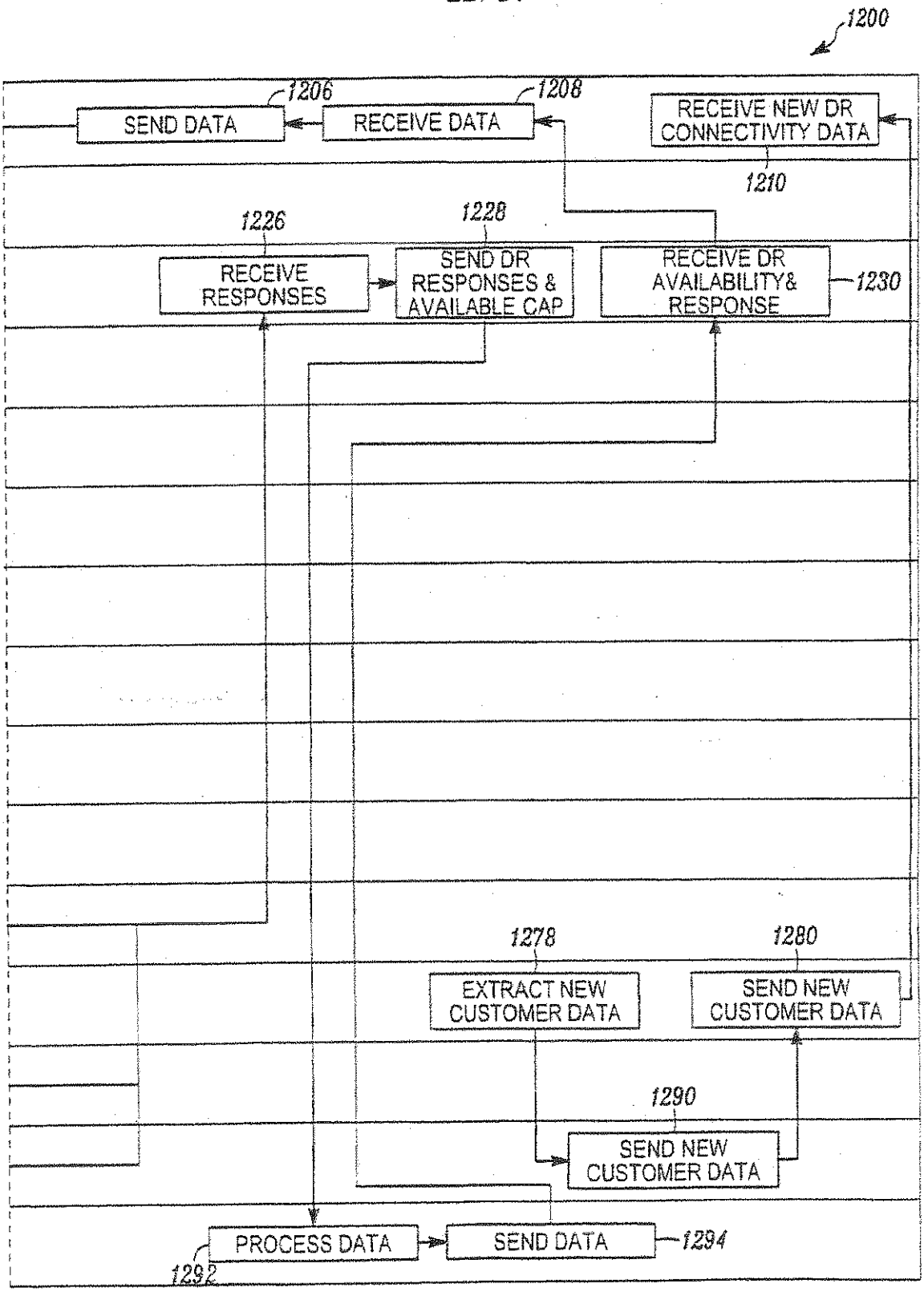

1200
1206
SEND DATA
1208
RECEIVE DATA
RECEIVE NEW DR CONNECTIVITY DATA
1210
1226
RECEIVE RESPONSES
1228
SEND DR RESPONSES & AVAILABLE CAP
RECEIVE DR AVAILABILITY& RESPONSE
1230
1278
EXTRACT NEW CUSTOMER DATA
1280
SEND NEW CUSTOMER DATA
1290
SEND NEW CUSTOMER DATA
PROCESS DATA
1292
SEND DATA
1294

FIG. 12C

FIG. 13

FIG. 13A|FIG. 13B

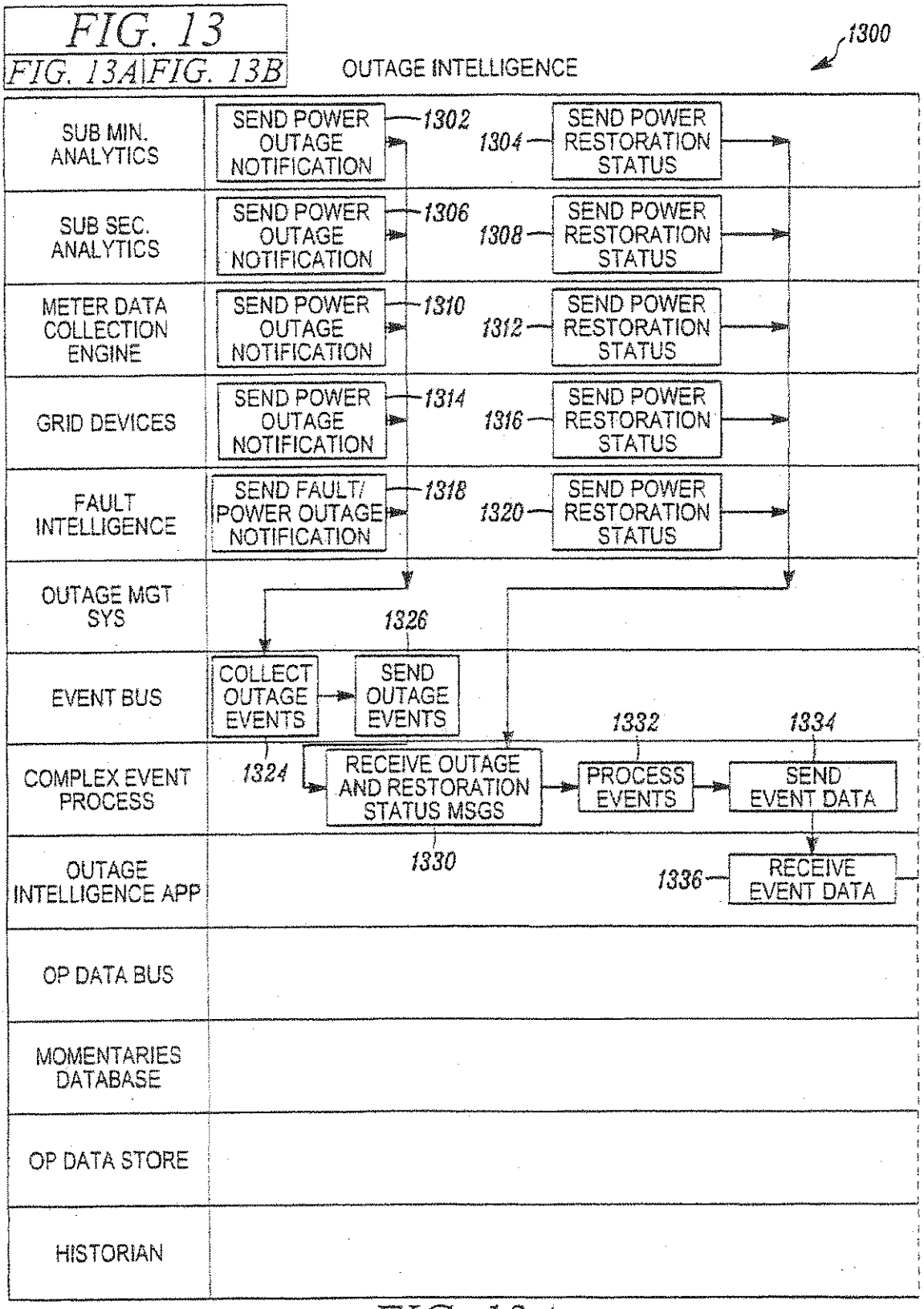


FIG. 13A

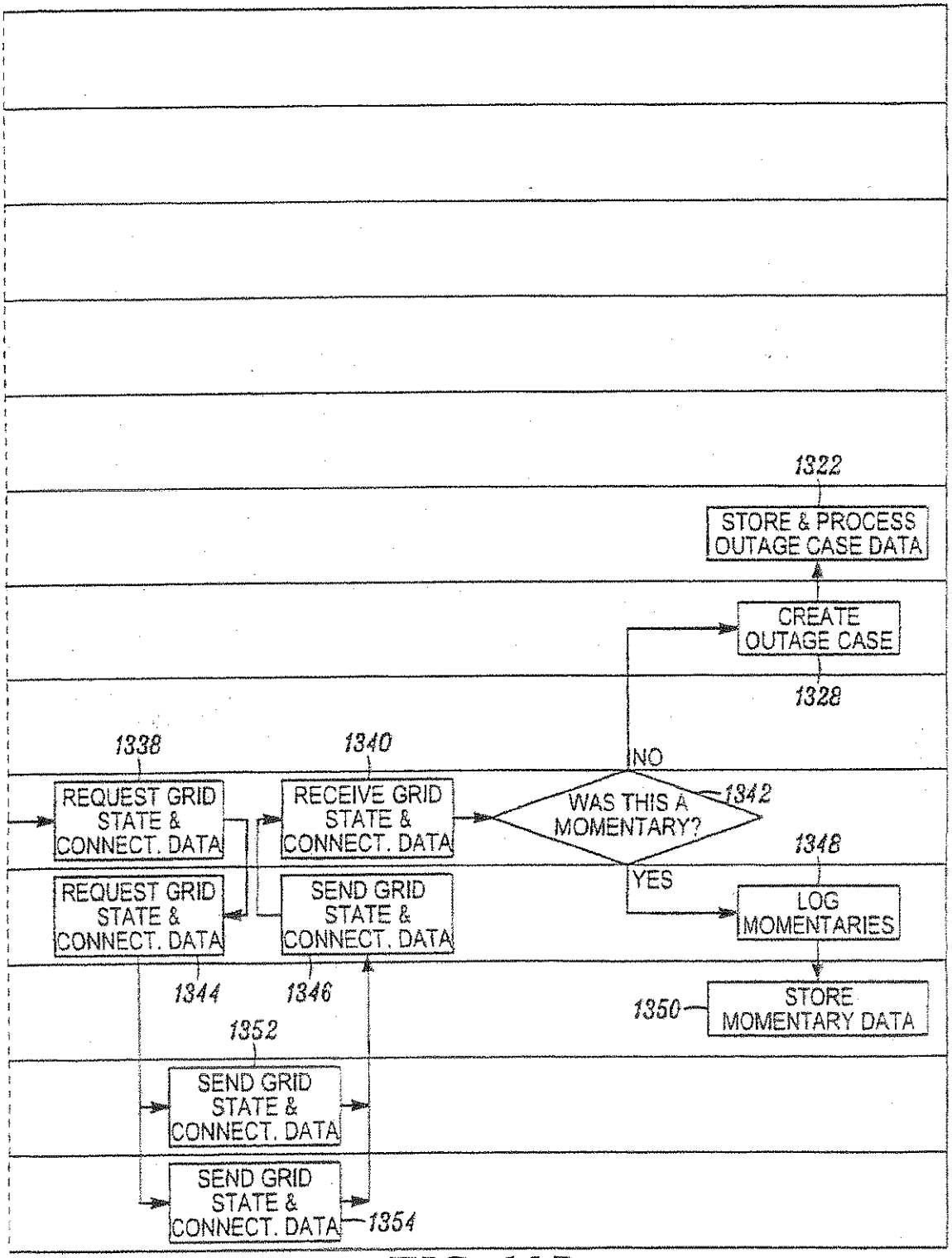

1322
STORE & PROCESS OUTAGE CASE DATA
CREATE OUTAGE CASE
1328
1338
1340
NO
REQUEST GRID STATE & CONNECT. DATA
RECEIVE GRID STATE & CONNECT. DATA
WAS THIS A MOMENTARY?
1342
1348
YES
REQUEST GRID STATE & CONNECT. DATA
SEND GRID STATE & CONNECT. DATA
LOG MOMENTARIES
1344
1346
1350
STORE MOMENTARY DATA
1352
SEND GRID STATE & CONNECT. DATA
SEND GRID STATE & CONNECT. DATA
1354

FIG. 13B

FIG. 14

FIG. 14A | FIG. 14B | FIG. 14C

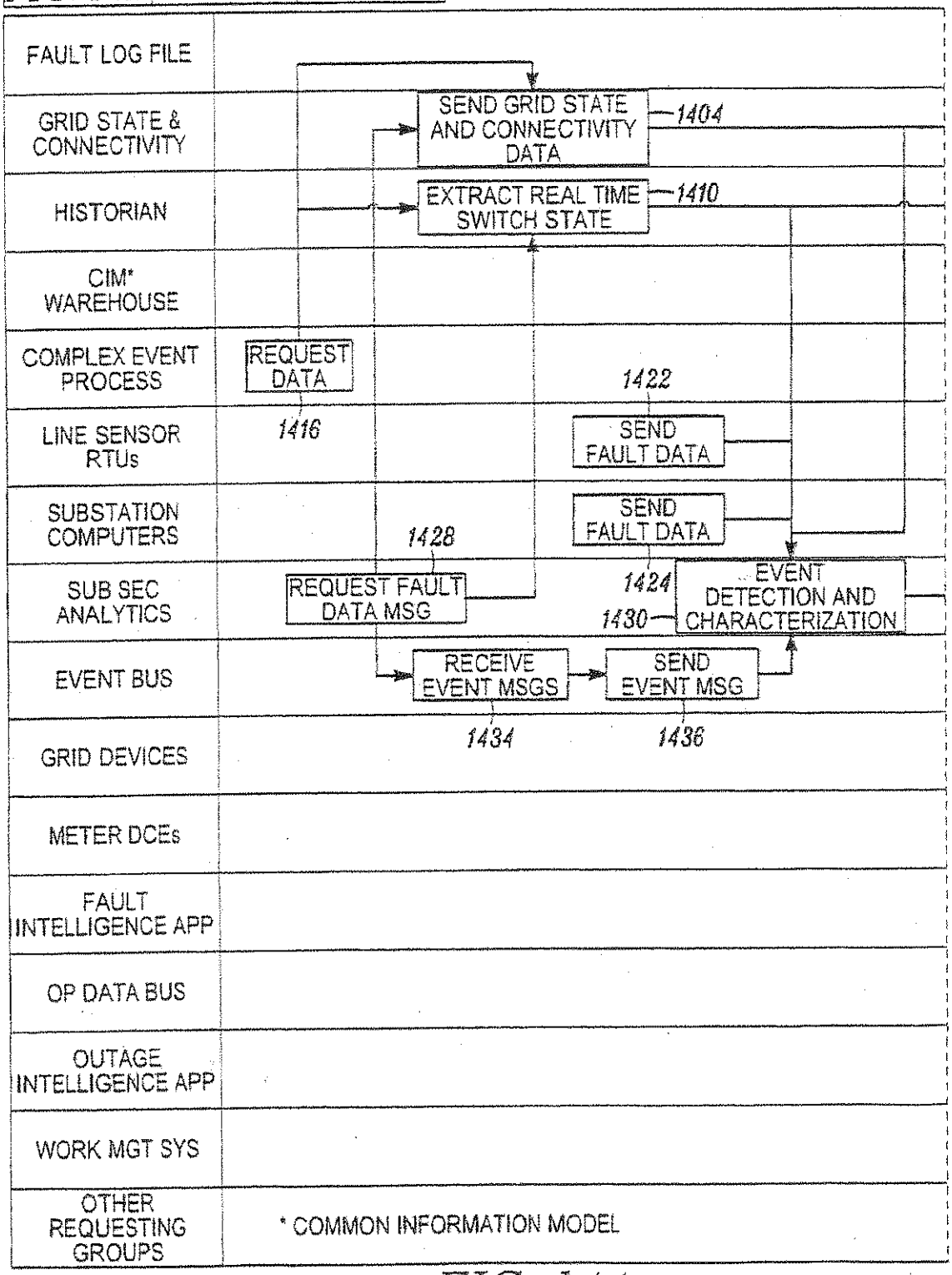


FIG. 14A

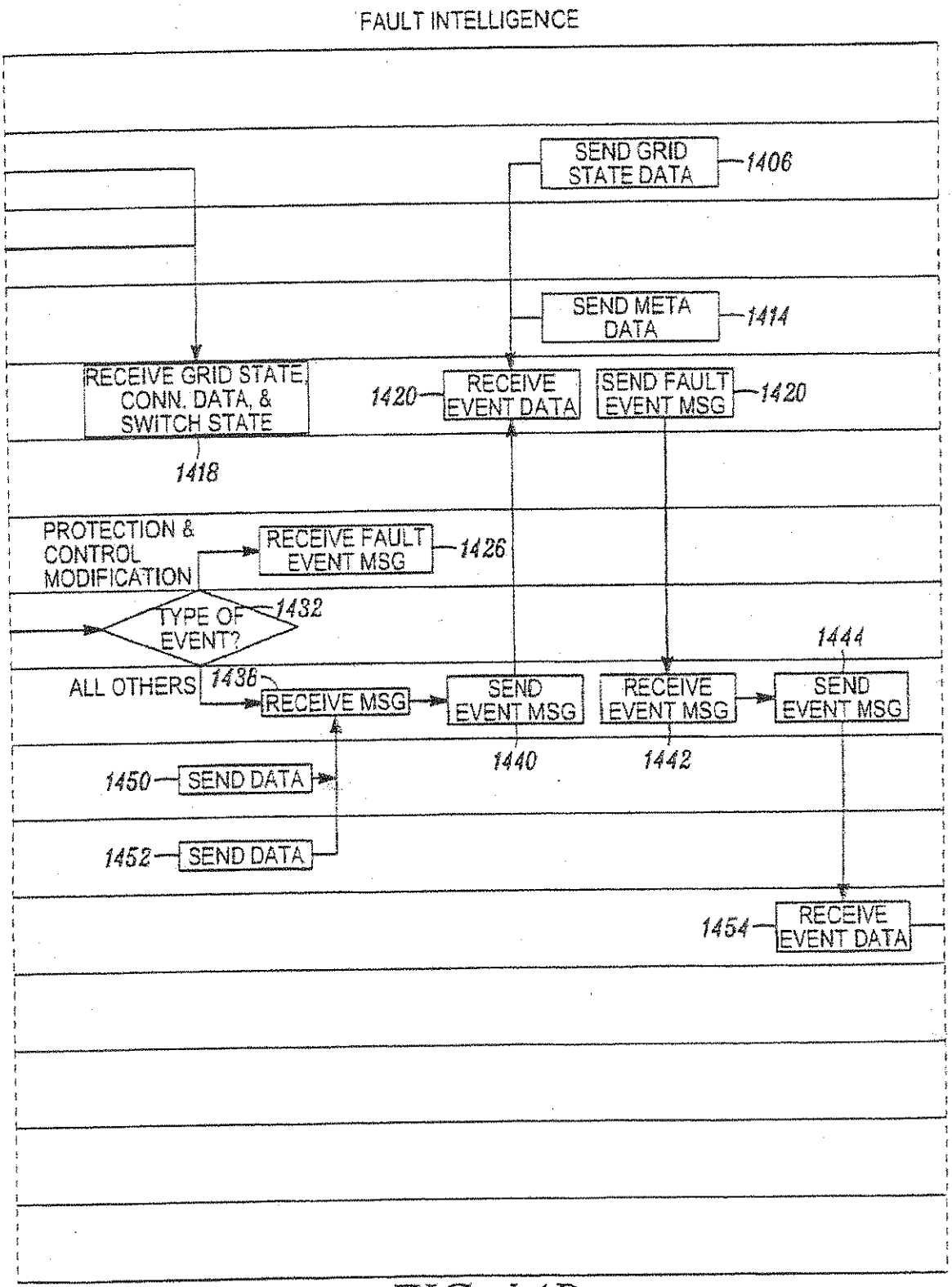

FAULT INTELLIGENCE
SEND GRID STATE DATA
1406
SEND META DATA
1414
RECEIVE GRID STATE, CONN. DATA, & SWITCH STATE
1418
1420
RECEIVE EVENT DATA
SEND FAULT EVENT MSG
1420
PROTECTION & CONTROL MODIFICATION
RECEIVE FAULT EVENT MSG
1426
TYPE OF EVENT?
1432
ALL OTHERS
1436
RECEIVE MSG
SEND EVENT MSG
1440
RECEIVE EVENT MSG
1442
SEND EVENT MSG
1444
1450
SEND DATA
1452
SEND DATA
1454
RECEIVE EVENT DATA

FIG. 14B

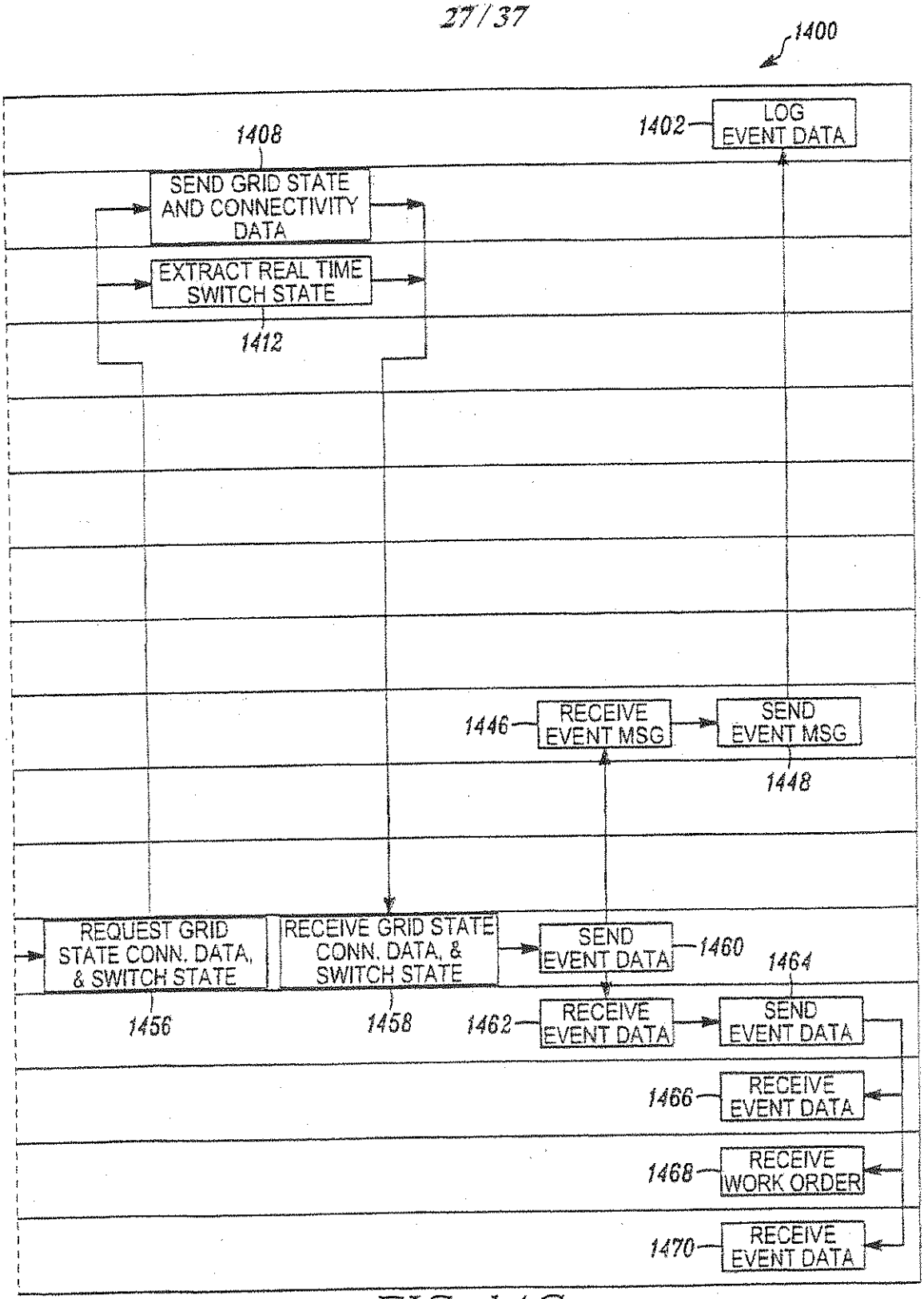

1400
1402
LOG EVENT DATA
1408
SEND GRID STATE AND CONNECTIVITY DATA
EXTRACT REAL TIME SWITCH STATE
1412
1446
RECEIVE EVENT MSG
SEND EVENT MSG
1448
REQUEST GRID STATE CONN. DATA, & SWITCH STATE
RECEIVE GRID STATE CONN. DATA, & SWITCH STATE
SEND EVENT DATA
1460
1464
1456
1458
1462
RECEIVE EVENT DATA
SEND EVENT DATA
1466
RECEIVE EVENT DATA
1468
RECEIVE WORK ORDER
1470
RECEIVE EVENT DATA

FIG. 14C

FIG. 15
FIG. 15A FIG. 15B

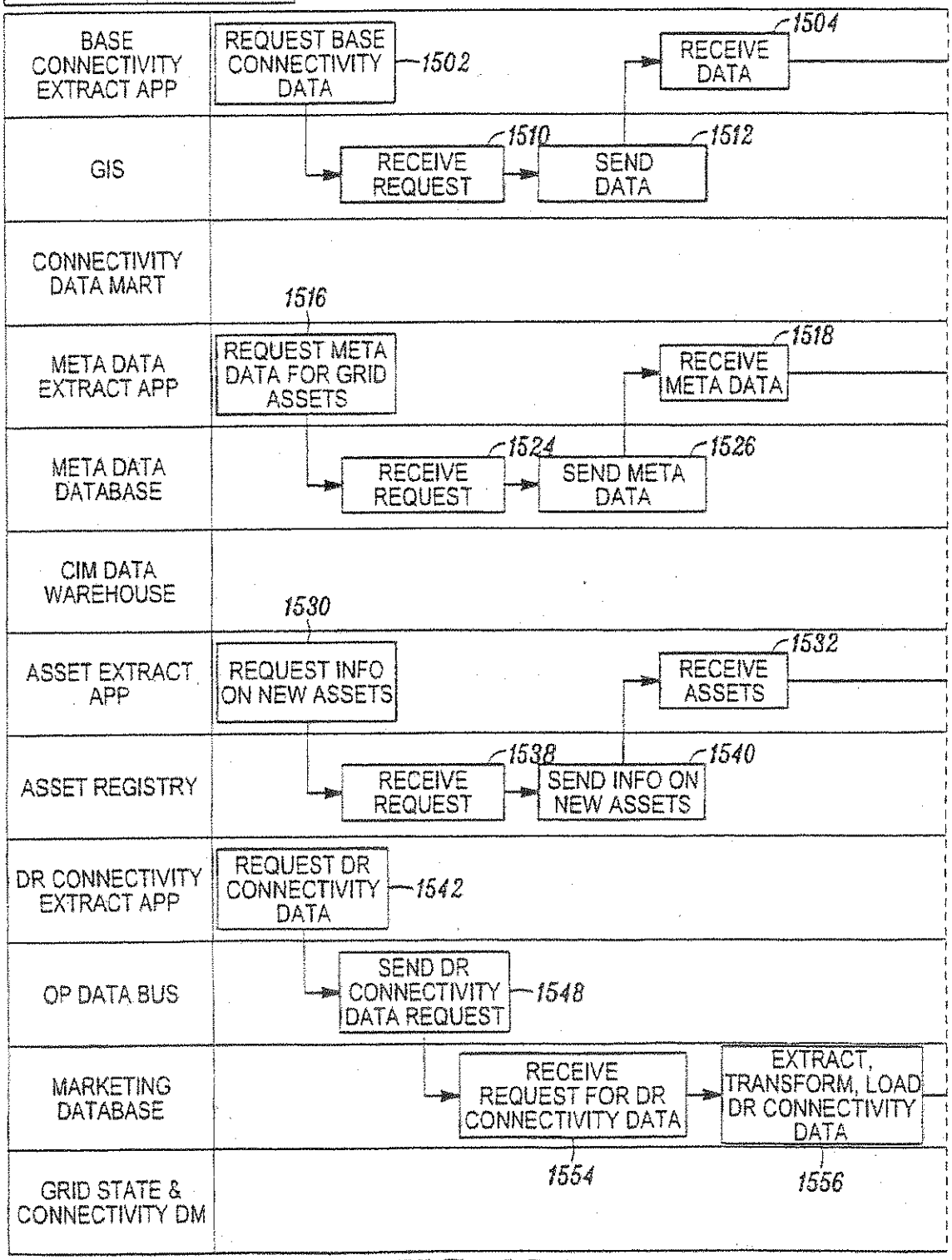


FIG. 15A

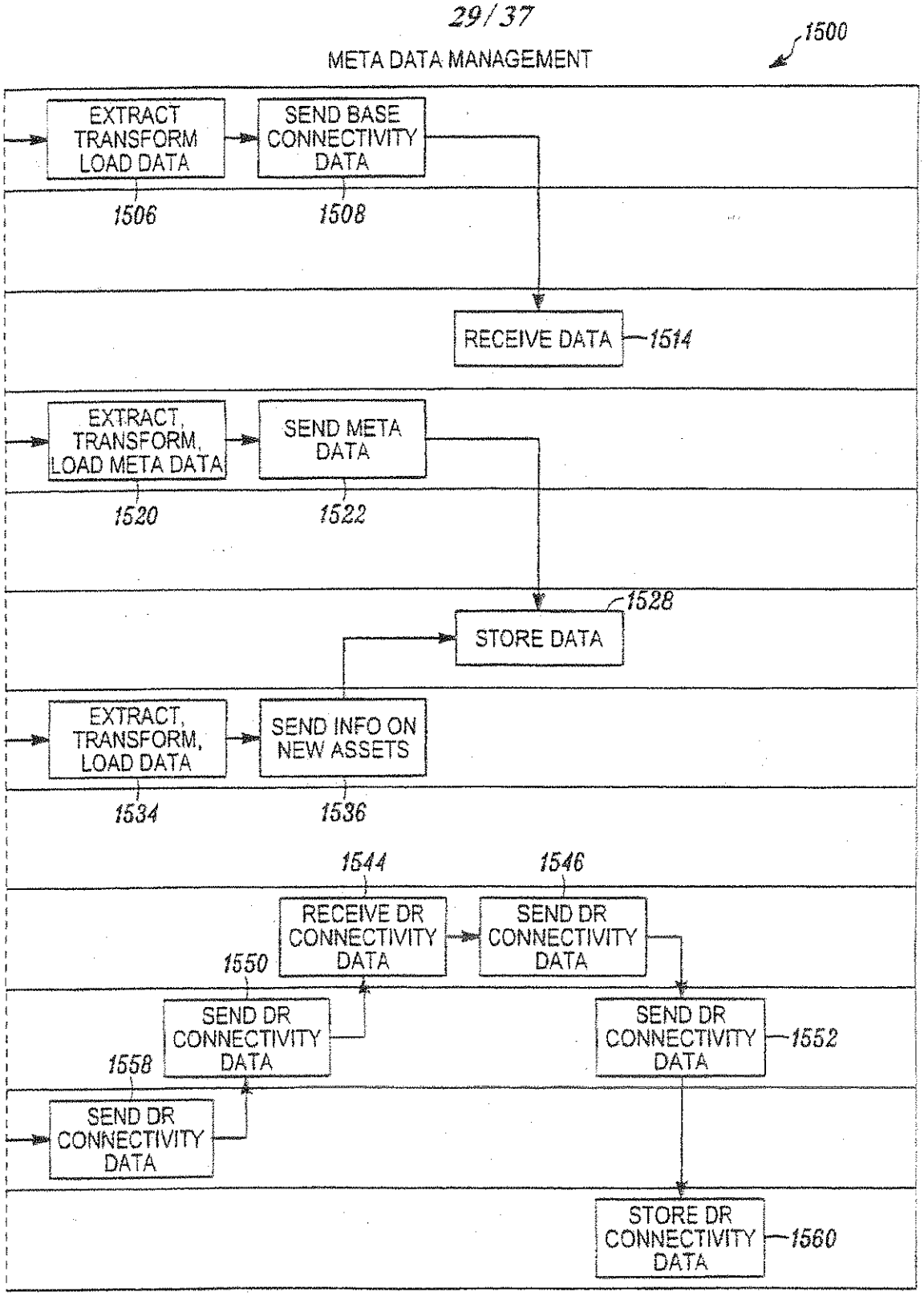

1500
META DATA MANAGEMENT
EXTRACT TRANSFORM LOAD DATA
1506
SEND BASE CONNECTIVITY DATA
1508
RECEIVE DATA
1514
EXTRACT, TRANSFORM, LOAD META DATA
1520
SEND META DATA
1522
1528
STORE DATA
EXTRACT, TRANSFORM, LOAD DATA
1534
SEND INFO ON NEW ASSETS
1536
1544
1546
RECEIVE DR CONNECTIVITY DATA
SEND DR CONNECTIVITY DATA
1550
SEND DR CONNECTIVITY DATA
SEND DR CONNECTIVITY DATA
1552
1558
SEND DR CONNECTIVITY DATA
STORE DR CONNECTIVITY DATA
1560

FIG. 15B

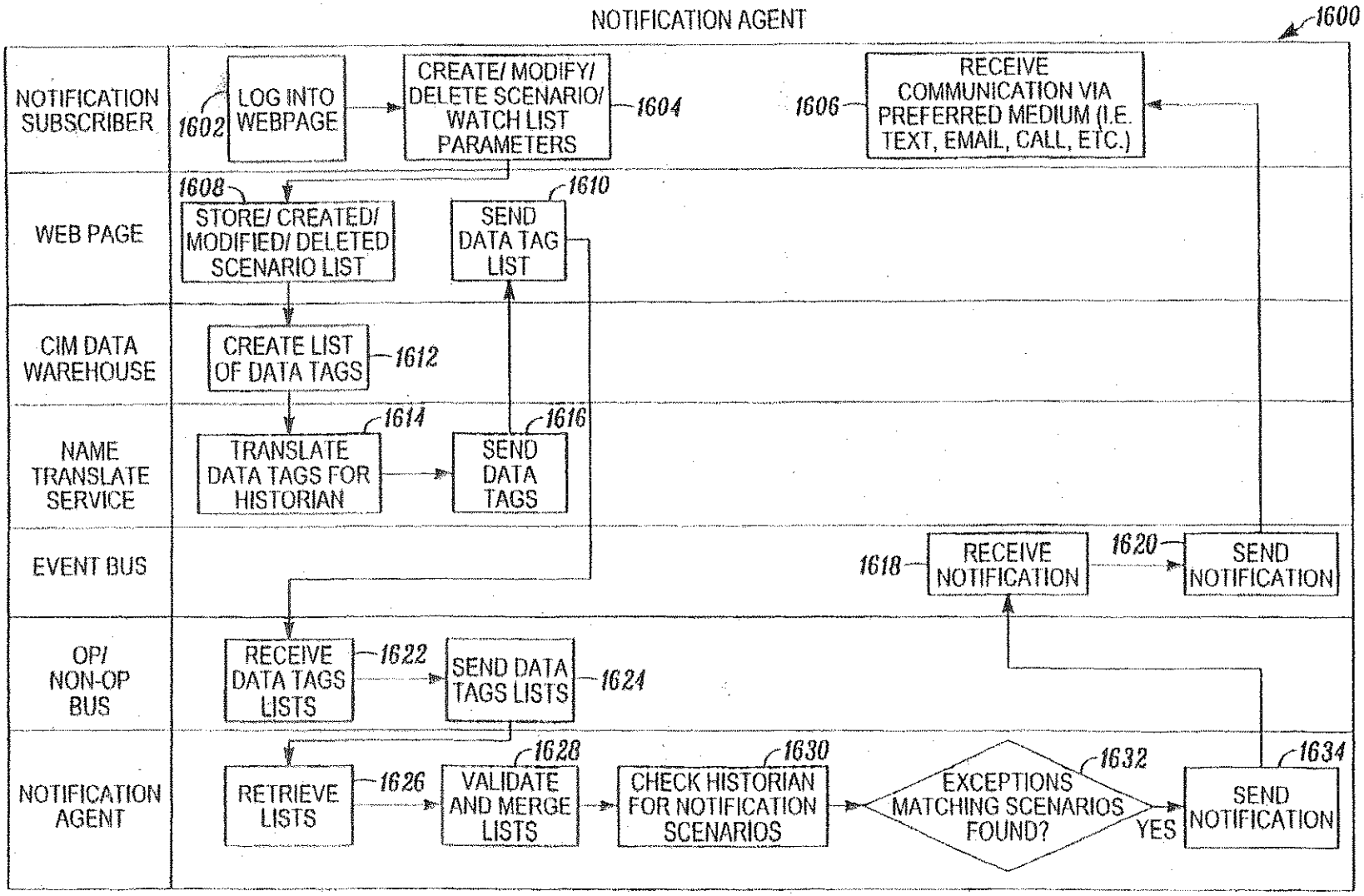

NOTIFICATION AGENT
1600
NOTIFICATION SUBSCRIBER
WEB PAGE
CIM DATA WAREHOUSE
NAME TRANSLATE SERVICE
EVENT BUS
OP/ NON-OP BUS
NOTIFICATION AGENT
1602
LOG INTO WEBPAGE
CREATE/ MODIFY/ DELETE SCENARIO/ WATCH LIST PARAMETERS
1604
1606
RECEIVE COMMUNICATION VIA PREFERRED MEDIUM (I.E. TEXT, EMAIL, CALL, ETC.)
1608
STORE/ CREATED/ MODIFIED/ DELETED SCENARIO LIST
1610
SEND DATA TAG LIST
CREATE LIST OF DATA TAGS
1612
1614
TRANSLATE DATA TAGS FOR HISTORIAN
1616
SEND DATA TAGS
1618
RECEIVE NOTIFICATION
1620
SEND NOTIFICATION
RECEIVE DATA TAGS LISTS
1622
SEND DATA TAGS LISTS
1624
RETRIEVE LISTS
1626
1628
VALIDATE AND MERGE LISTS
1630
CHECK HISTORIAN FOR NOTIFICATION SCENARIOS
1632
EXCEPTIONS MATCHING SCENARIOS FOUND?
YES
1634
SEND NOTIFICATION

FIG. 16

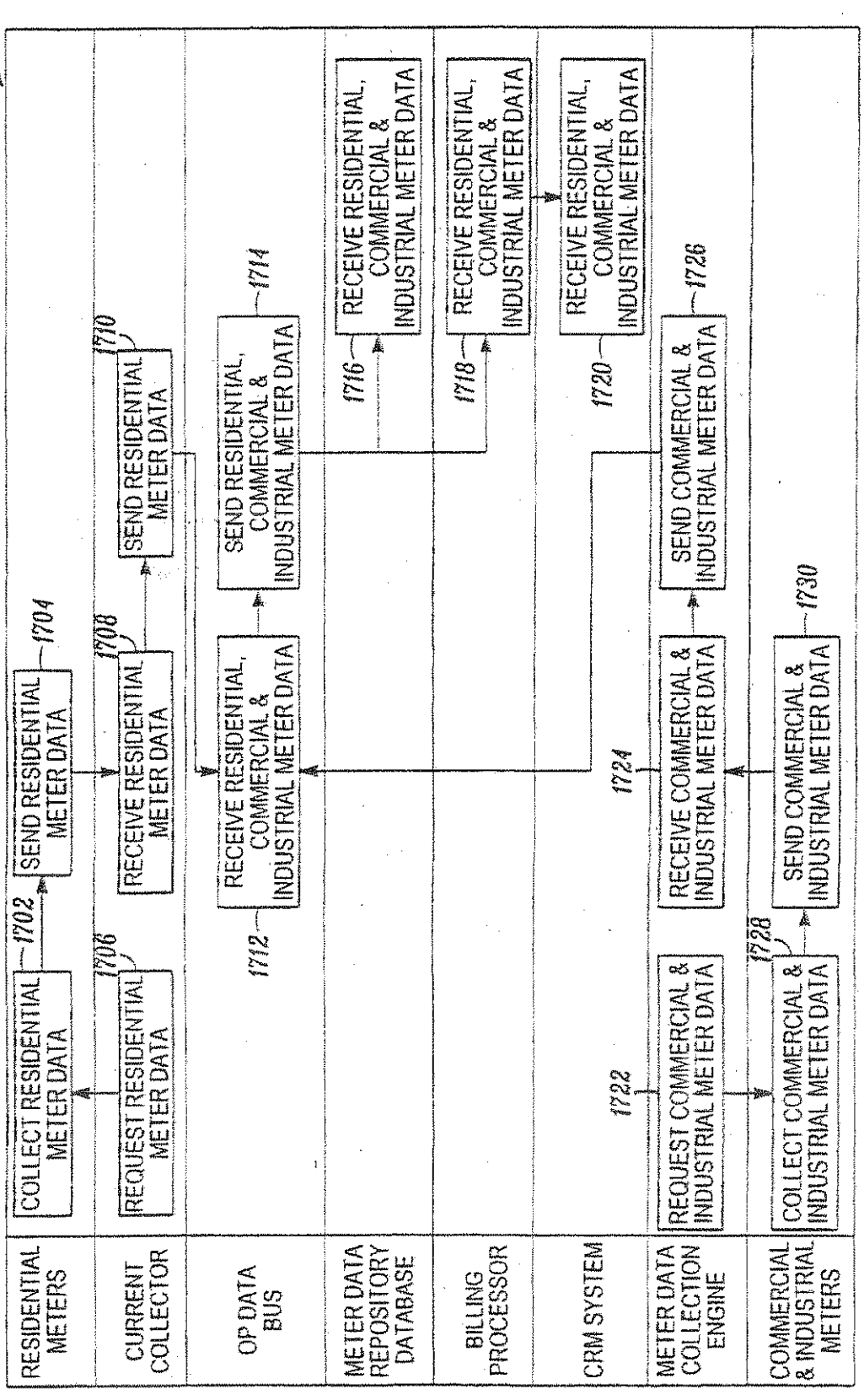

1700
COLLECTING METER DATA (AMI)
RESIDENTIAL METERS
CURRENT COLLECTOR
OP DATA BUS
METER DATA REPOSITORY DATABASE
BILLING PROCESSOR
CRM SYSTEM
METER DATA COLLECTION ENGINE
COMMERCIAL & INDUSTRIAL METERS
COLLECT RESIDENTIAL METER DATA
1702
SEND RESIDENTIAL METER DATA
1704
REQUEST RESIDENTIAL METER DATA
1706
RECEIVE RESIDENTIAL METER DATA
1708
SEND RESIDENTIAL METER DATA
1710
RECEIVE RESIDENTIAL, COMMERCIAL & INDUSTRIAL METER DATA
1712
SEND RESIDENTIAL, COMMERCIAL & INDUSTRIAL METER DATA
1714
RECEIVE RESIDENTIAL, COMMERCIAL & INDUSTRIAL METER DATA
1716
RECEIVE RESIDENTIAL, COMMERCIAL & INDUSTRIAL METER DATA
1718
RECEIVE RESIDENTIAL, COMMERCIAL & INDUSTRIAL METER DATA
1720
1722
REQUEST COMMERCIAL & INDUSTRIAL METER DATA
1724
RECEIVE COMMERCIAL & INDUSTRIAL METER DATA
SEND COMMERCIAL & INDUSTRIAL METER DATA
1726
1728
COLLECT COMMERCIAL & INDUSTRIAL METER DATA
SEND COMMERCIAL & INDUSTRIAL METER DATA
1730

FIG. 17

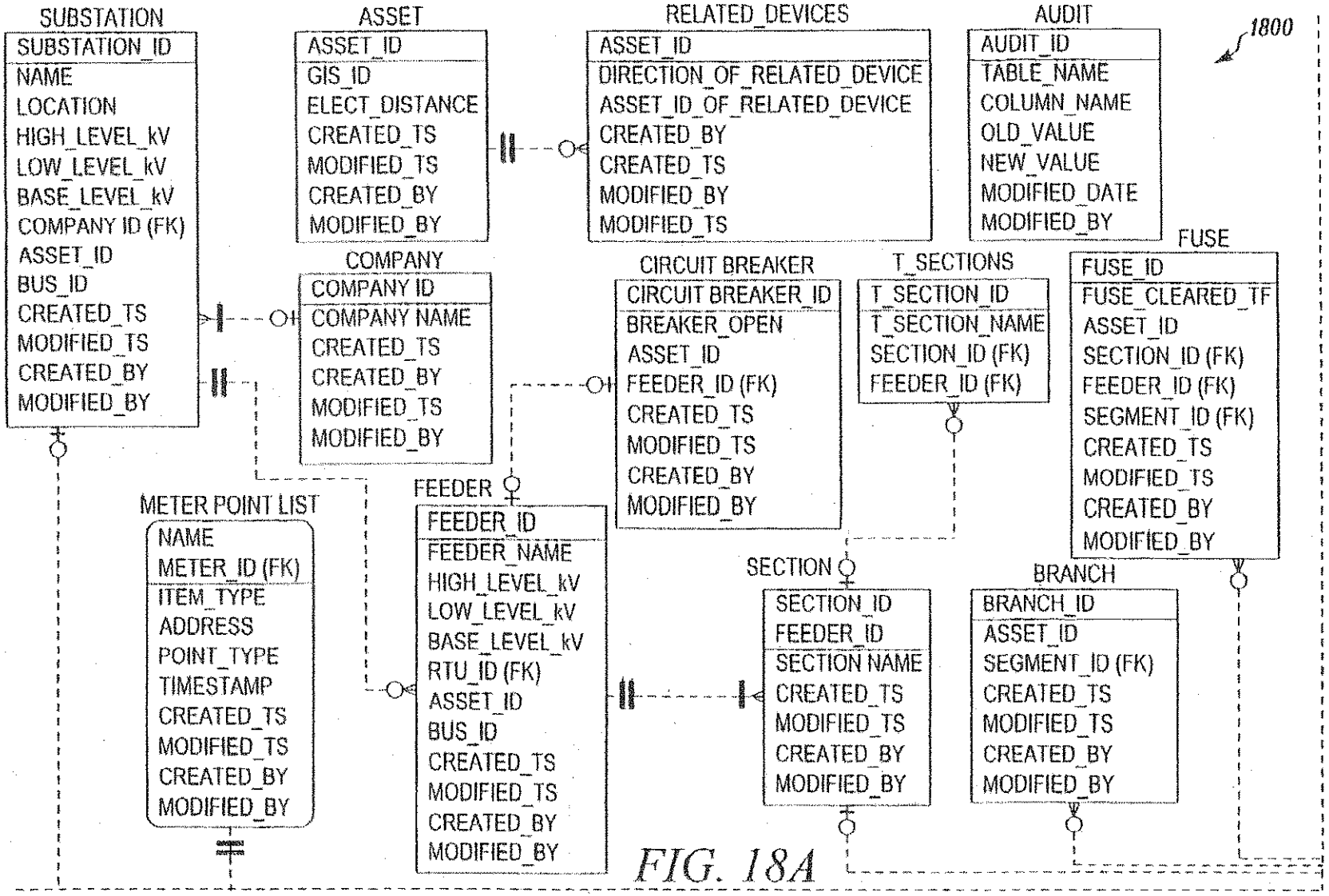

SUBSTATION
SUBSTATION_ID
NAME
LOCATION
HIGH_LEVEL_kV
LOW_LEVEL_kV
BASE_LEVEL_kV
COMPANY ID (FK)
ASSET_ID
BUS_ID
CREATED_TS
MODIFIED_TS
CREATED_BY
MODIFIED_BY
ASSET
ASSET_ID
GIS_ID
ELECT_DISTANCE
CREATED_TS
MODIFIED_TS
CREATED_BY
MODIFIED_BY
RELATED_DEVICES
ASSET_ID
DIRECTION_OF_RELATED_DEVICE
ASSET_ID_OF_RELATED_DEVICE
CREATED_BY
CREATED_TS
MODIFIED_BY
MODIFIED_TS
AUDIT
AUDIT_ID
TABLE_NAME
COLUMN_NAME
OLD_VALUE
NEW_VALUE
MODIFIED_DATE
MODIFIED_BY
1800
COMPANY
COMPANY ID
COMPANY NAME
CREATED_TS
CREATED_BY
MODIFIED_TS
MODIFIED_BY
CIRCUIT BREAKER
CIRCUIT BREAKER_ID
BREAKER_OPEN
ASSET_ID
FEEDER_ID (FK)
CREATED_TS
MODIFIED_TS
CREATED_BY
MODIFIED_BY
T_SECTIONS
T_SECTION_ID
T_SECTION_NAME
SECTION_ID (FK)
FEEDER_ID (FK)
FUSE
FUSE_ID
FUSE_CLEARED_TF
ASSET_ID
SECTION_ID (FK)
FEEDER_ID (FK)
SEGMENT_ID (FK)
CREATED_TS
MODIFIED_TS
CREATED_BY
MODIFIED_BY
METER POINT LIST
NAME
METER_ID (FK)
ITEM_TYPE
ADDRESS
POINT_TYPE
TIMESTAMP
CREATED_TS
MODIFIED_TS
CREATED_BY
MODIFIED_BY
FEEDER
FEEDER_ID
FEEDER_NAME
HIGH_LEVEL_kV
LOW_LEVEL_kV
BASE_LEVEL_kV
RTU_ID (FK)
ASSET_ID
BUS_ID
CREATED_TS
MODIFIED_TS
CREATED_BY
MODIFIED_BY
SECTION
SECTION_ID
FEEDER_ID
SECTION NAME
CREATED_TS
MODIFIED_TS
CREATED_BY
MODIFIED_BY
BRANCH
BRANCH_ID
ASSET_ID
SEGMENT_ID (FK)
CREATED_TS
MODIFIED_TS
CREATED_BY
MODIFIED_BY

FIG. 18A

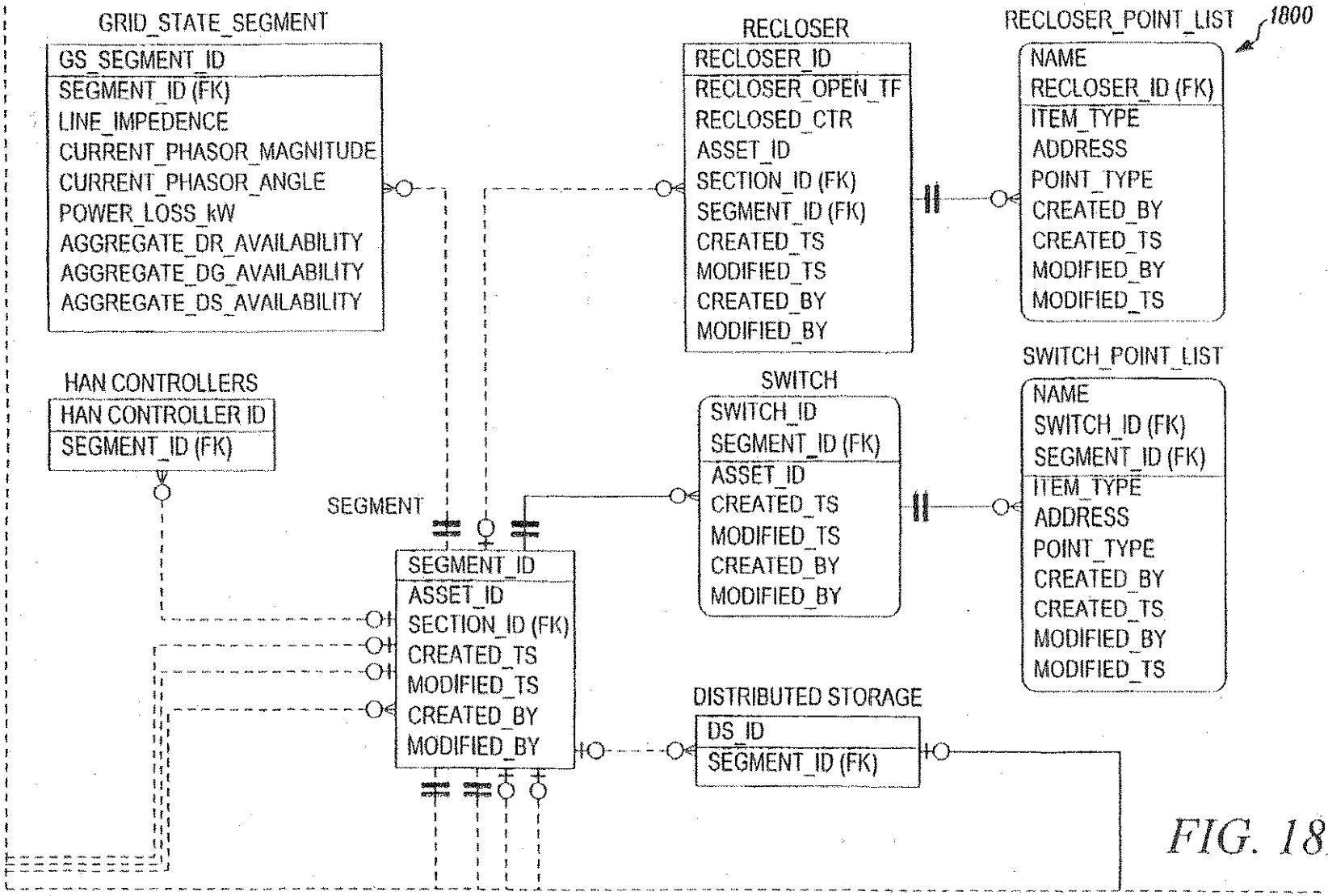

GRID_STATE_SEGMENT
GS_SEGMENT_ID
SEGMENT_ID (FK)
LINE_IMPEDENCE
CURRENT_PHASOR_MAGNITUDE
CURRENT_PHASOR_ANGLE
POWER_LOSS_kW
AGGREGATE_DR_AVAILABILITY
AGGREGATE_DG_AVAILABILITY
AGGREGATE_DS_AVAILABILITY
RECLOSER
RECLOSER_ID
RECLOSER_OPEN_TF
RECLOSED_CTR
ASSET_ID
SECTION_ID (FK)
SEGMENT_ID (FK)
CREATED_TS
MODIFIED_TS
CREATED_BY
MODIFIED_BY
RECLOSER_POINT_LIST
1800
NAME
RECLOSER_ID (FK)
ITEM_TYPE
ADDRESS
POINT_TYPE
CREATED_BY
CREATED_TS
MODIFIED_BY
MODIFIED_TS
HAN CONTROLLERS
HAN CONTROLLER ID
SEGMENT_ID (FK)
SEGMENT
SWITCH
SWITCH_ID
SEGMENT_ID (FK)
ASSET_ID
CREATED_TS
MODIFIED_TS
CREATED_BY
MODIFIED_BY
SWITCH_POINT_LIST
NAME
SWITCH_ID (FK)
SEGMENT_ID (FK)
ITEM_TYPE
ADDRESS
POINT_TYPE
CREATED_BY
CREATED_TS
MODIFIED_BY
MODIFIED_TS
SEGMENT_ID
ASSET_ID
SECTION_ID (FK)
CREATED_TS
MODIFIED_TS
CREATED_BY
MODIFIED_BY
DISTRIBUTED STORAGE
DS_ID
SEGMENT_ID (FK)

FIG. 18B

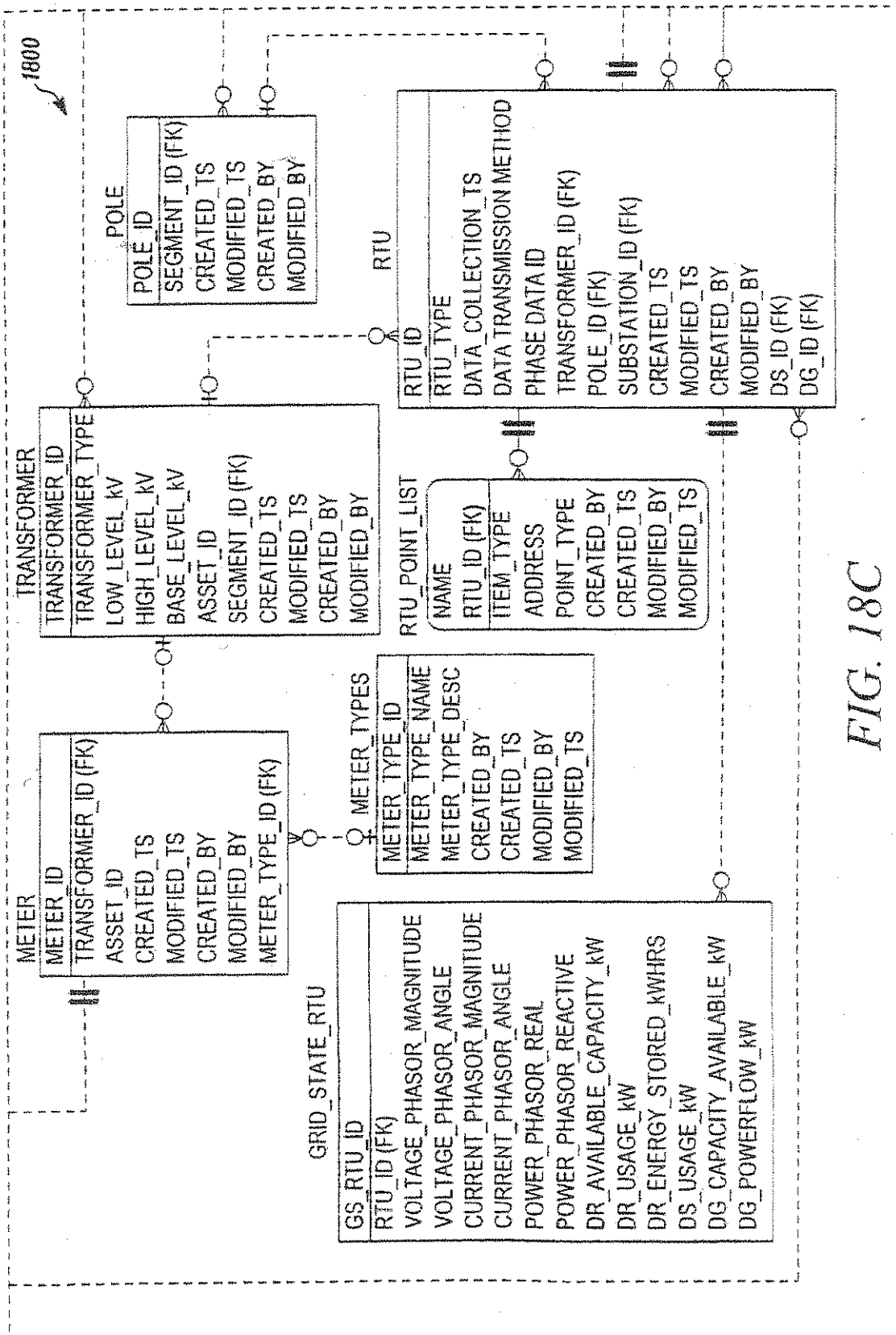

1800
METER
METER_ID
TRANSFORMER_ID (FK)
ASSET_ID
CREATED_TS
MODIFIED_TS
CREATED_BY
MODIFIED_BY
METER_TYPE_ID (FK)
TRANSFORMER
TRANSFORMER_ID
TRANSFORMER_TYPE
LOW_LEVEL_kV
HIGH_LEVEL_kV
BASE_LEVEL_kV
ASSET_ID
SEGMENT_ID (FK)
CREATED_TS
MODIFIED_TS
CREATED_BY
MODIFIED_BY
POLE
POLE_ID
SEGMENT_ID (FK)
CREATED_TS
MODIFIED_TS
CREATED_BY
MODIFIED_BY
RTU
RTU_ID
RTU_TYPE
DATA_COLLECTION_TS
DATA TRANSMISSION METHOD
PHASE DATA ID
TRANSFORMER_ID (FK)
POLE_ID (FK)
SUBSTATION_ID (FK)
CREATED_TS
MODIFIED_TS
CREATED_BY
MODIFIED_BY
DS_ID (FK)
DG_ID (FK)
METER_TYPES
METER_TYPE_ID
METER_TYPE_NAME
METER_TYPE_DESC
CREATED_BY
CREATED_TS
MODIFIED_BY
MODIFIED_TS
RTU_POINT_LIST
NAME
RTU_ID (FK)
ITEM_TYPE
ADDRESS
POINT_TYPE
CREATED_BY
CREATED_TS
MODIFIED_BY
MODIFIED_TS
GRID_STATE_RTU
GS_RTU_ID
RTU_ID (FK)
VOLTAGE_PHASOR_MAGNITUDE
VOLTAGE_PHASOR_ANGLE
CURRENT_PHASOR_MAGNITUDE
CURRENT_PHASOR_ANGLE
POWER_PHASOR_REAL
POWER_PHASOR_REACTIVE
DR_AVAILABLE_CAPACITY_kW
DR_USAGE_kW
DR_ENERGY_STORED_kWHRS
DS_USAGE_kW
DG_CAPACITY_AVAILABLE_kW
DG_POWERFLOW_kW

FIG. 18C

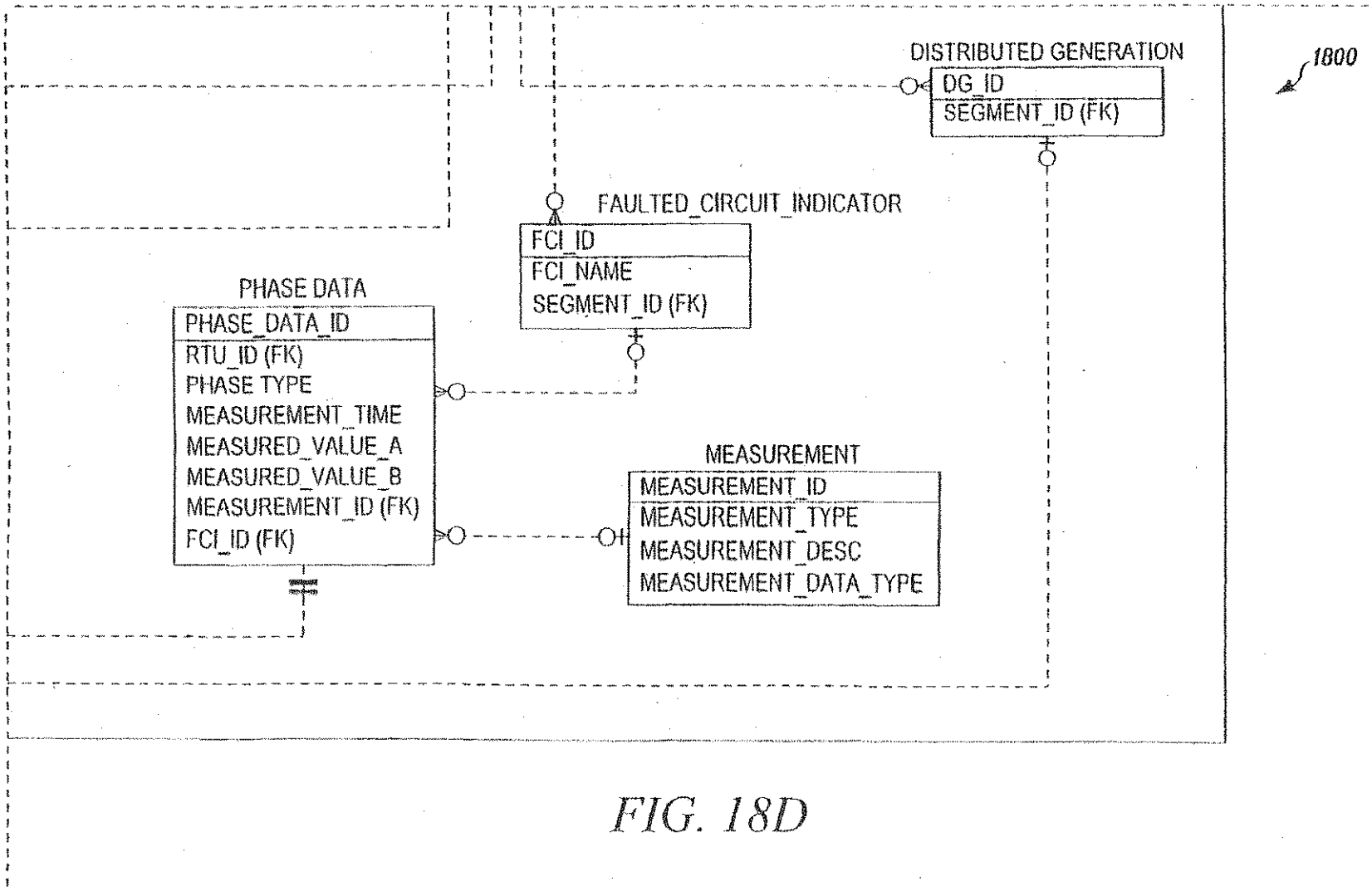

1800
DISTRIBUTED GENERATION
DG_ID
SEGMENT_ID (FK)
FAULTED_CIRCUIT_INDICATOR
FCI_ID
FCI_NAME
SEGMENT_ID (FK)
PHASE DATA
PHASE_DATA_ID
RTU_ID (FK)
PHASE TYPE
MEASUREMENT_TIME
MEASURED_VALUE_A
MEASURED_VALUE_B
MEASUREMENT_ID (FK)
FCI_ID (FK)
MEASUREMENT
MEASUREMENT_ID
MEASUREMENT_TYPE
MEASUREMENT_DESC
MEASUREMENT_DATA_TYPE

FIG. 18D

FIG. 19
FIG. 19A | FIG. 19B

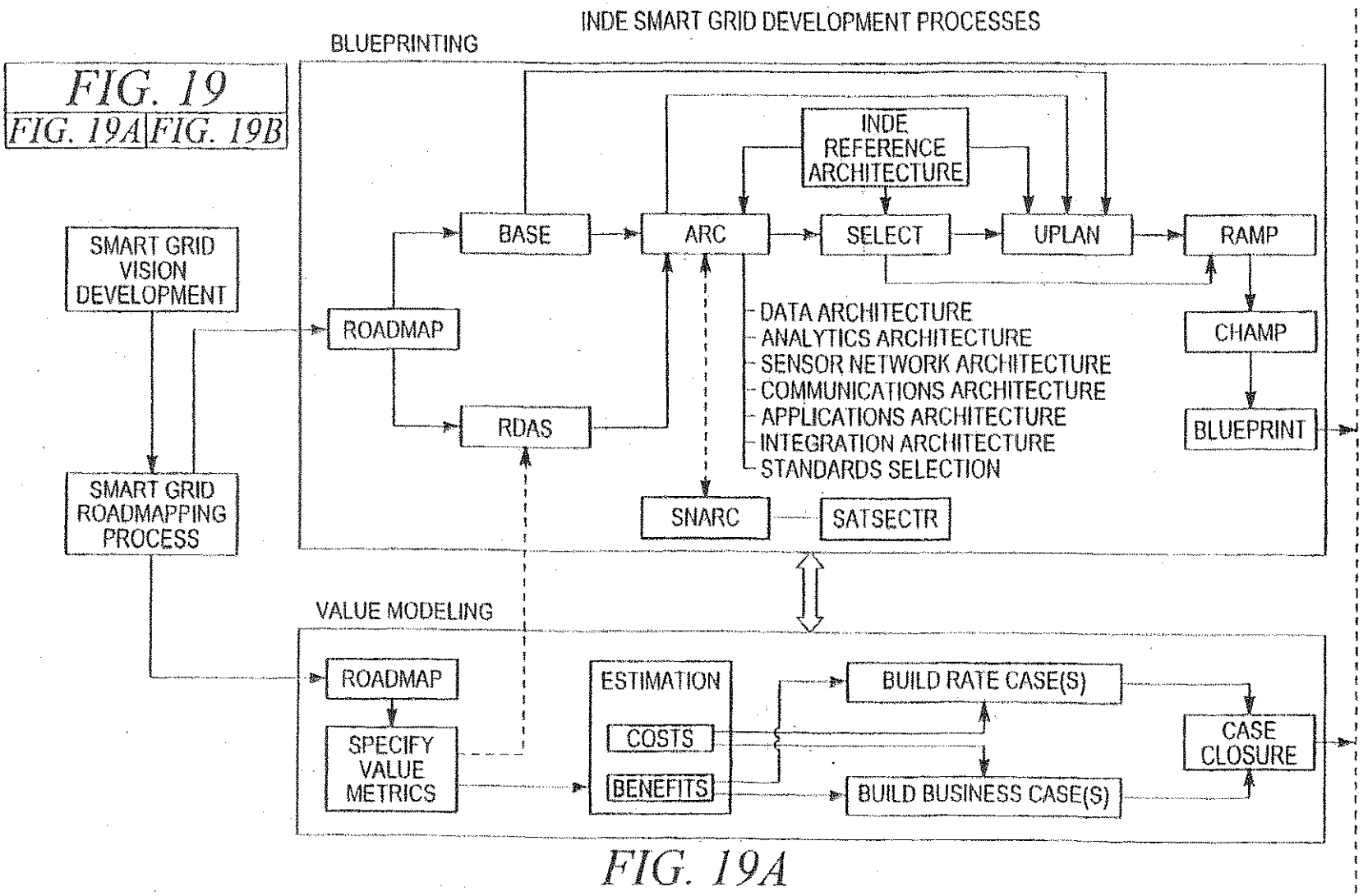


FIG. 19A

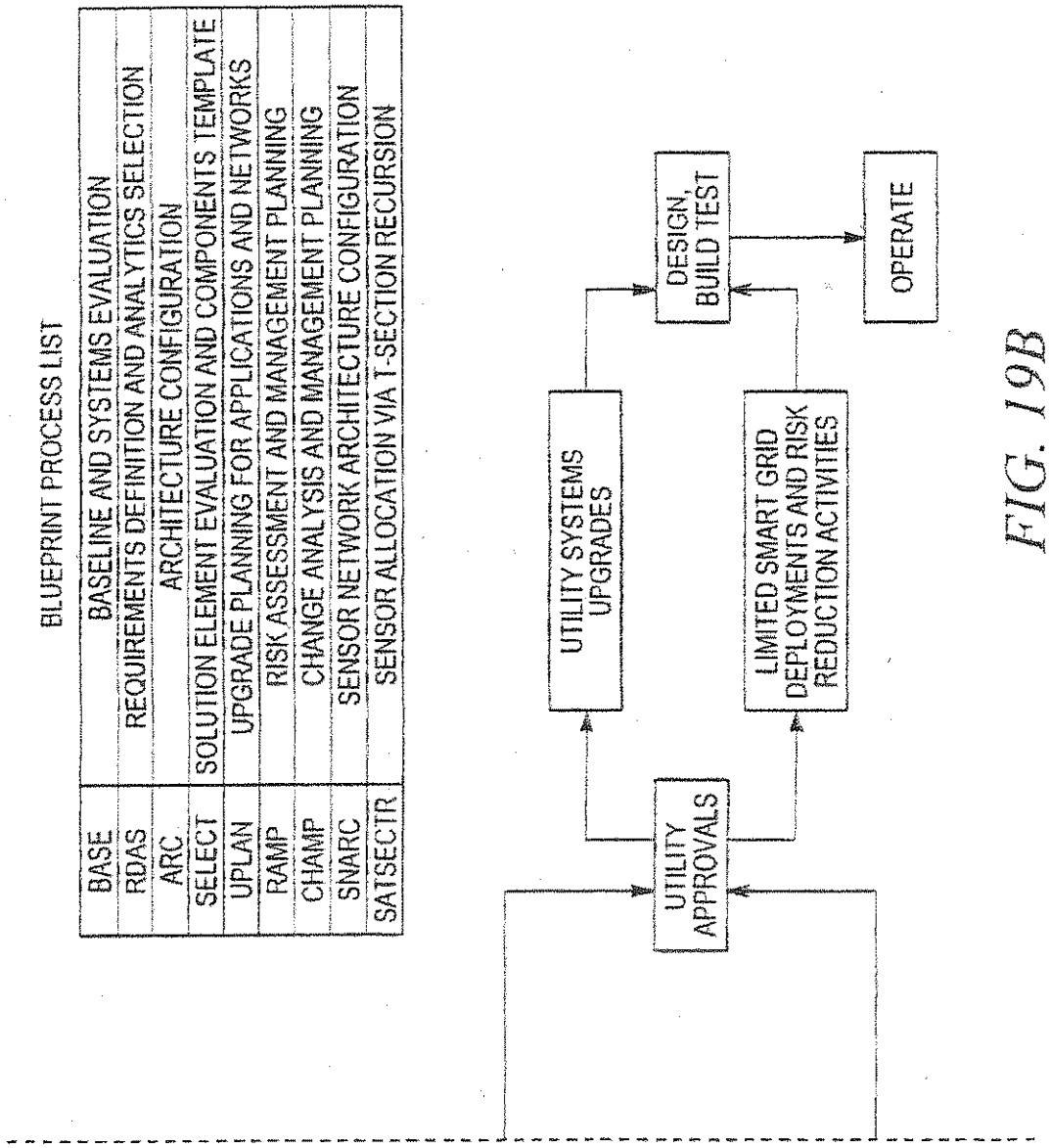

BLUEPRINT PROCESS LIST
BASE
BASELINE AND SYSTEMS EVALUATION
RDAS
REQUIREMENTS DEFINITION AND ANALYTICS SELECTION
ARC
ARCHITECTURE CONFIGURATION
SELECT
SOLUTION ELEMENT EVALUATION AND COMPONENTS TEMPLATE
UPLAN
UPGRADE PLANNING FOR APPLICATIONS AND NETWORKS
RAMP
RISK ASSESSMENT AND MANAGEMENT PLANNING
CHAMP
CHANGE ANALYSIS AND MANAGEMENT PLANNING
SNARC
SENSOR NETWORK ARCHITECTURE CONFIGURATION
SATSECTR
SENSOR ALLOCATION VIA T-SECTION RECURSION
UTILITY APPROVALS
UTILITY SYSTEMS UPGRADES
LIMITED SMART GRID DEPLOYMENTS AND RISK REDUCTION ACTIVITIES
DESIGN, BUILD TEST
OPERATE

FIG. 19B