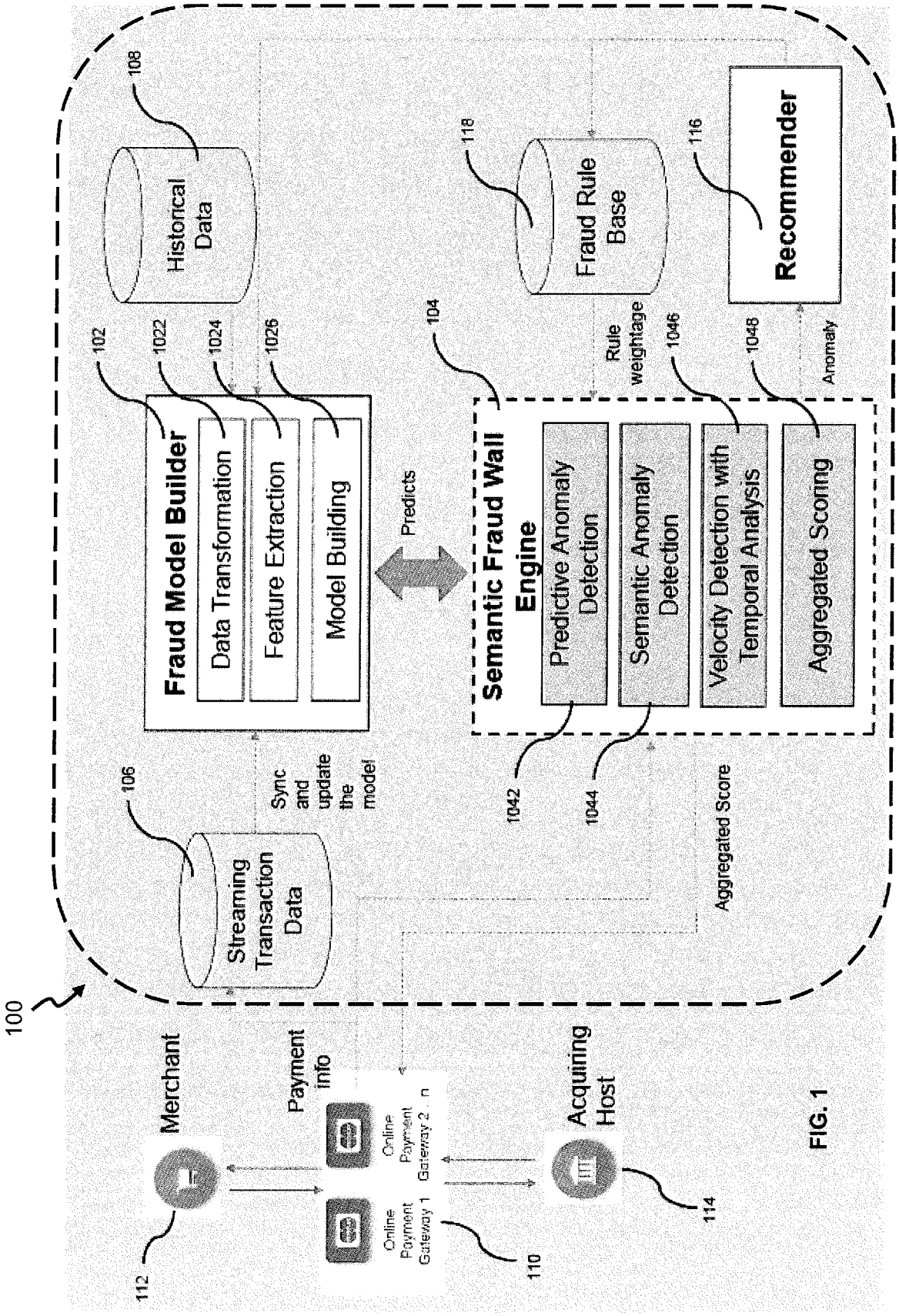

100
Merchant
112
Payment info
Online Payment Gateway 1
Online Payment Gateway 2 ... n
110
Acquiring Host
114
Streaming Transaction Data
106
Historical Data
108
Fraud Model Builder
102
Data Transformation
1022
Feature Extraction
1024
Model Building
1026
Sync and update the model
Predicts
Semantic Fraud Wall Engine
104
Predictive Anomaly Detection
1042
Semantic Anomaly Detection
1044
Velocity Detection with Temporal Analysis
1046
Aggregated Scoring
1048
Aggregated Score
Fraud Rule Base
118
Rule weightage
Anomaly
Recommender
116

FIG. 1

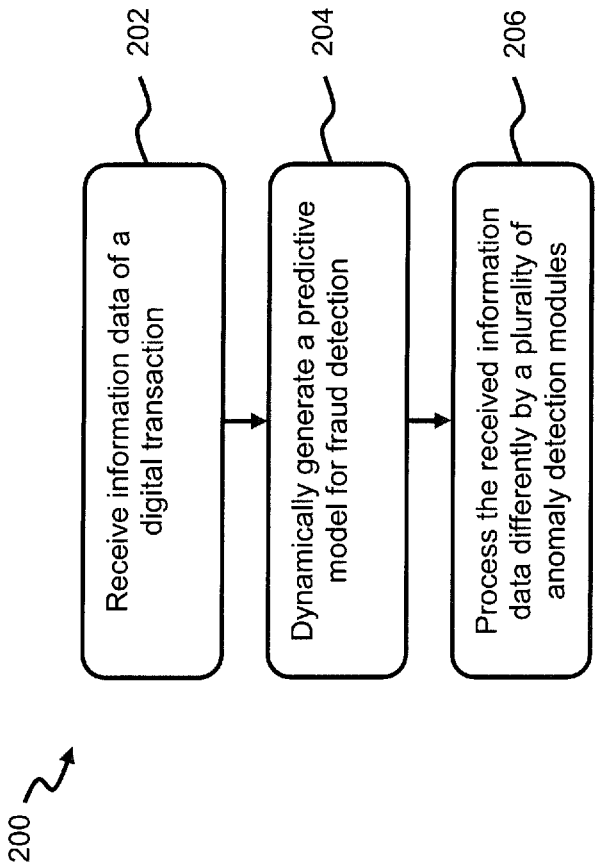

200
202
Receive information data of a digital transaction
204
Dynamically generate a predictive model for fraud detection
206
Process the received information data differently by a plurality of anomaly detection modules

FIG. 2

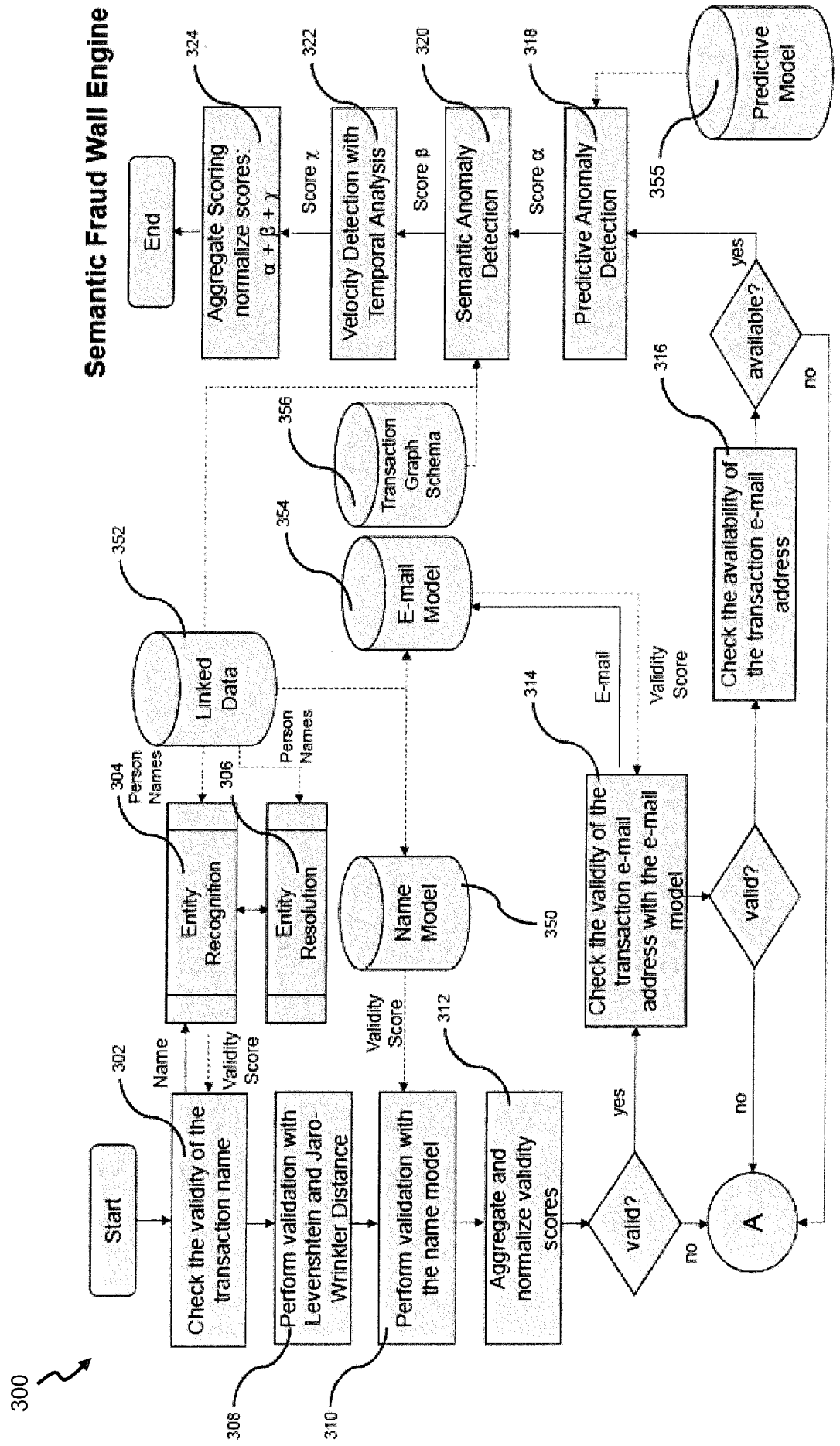

300
Semantic Fraud Wall Engine
Start
Check the validity of the transaction name
Name
Validity Score
302
Perform validation with Levenshtein and Jaro-Wrinkler Distance
308
Perform validation with the name model
310
Validity Score
Aggregate and normalize validity scores
312
valid?
yes
no
A
Check the validity of the transaction e-mail address with the e-mail model
314
E-mail
Validity Score
valid?
yes
no
Check the availability of the transaction e-mail address
316
available?
yes
no
Predictive Anomaly Detection
318
Score α
Semantic Anomaly Detection
320
Score β
Velocity Detection with Temporal Analysis
322
Score χ
Aggregate Scoring normalize scores: α + β + χ
324
End
Entity Recognition
304
Person Names
Entity Resolution
306
Person Names
Linked Data
352
Name Model
350
E-mail Model
354
Transaction Graph Schema
356
Predictive Model
355

FIG. 3

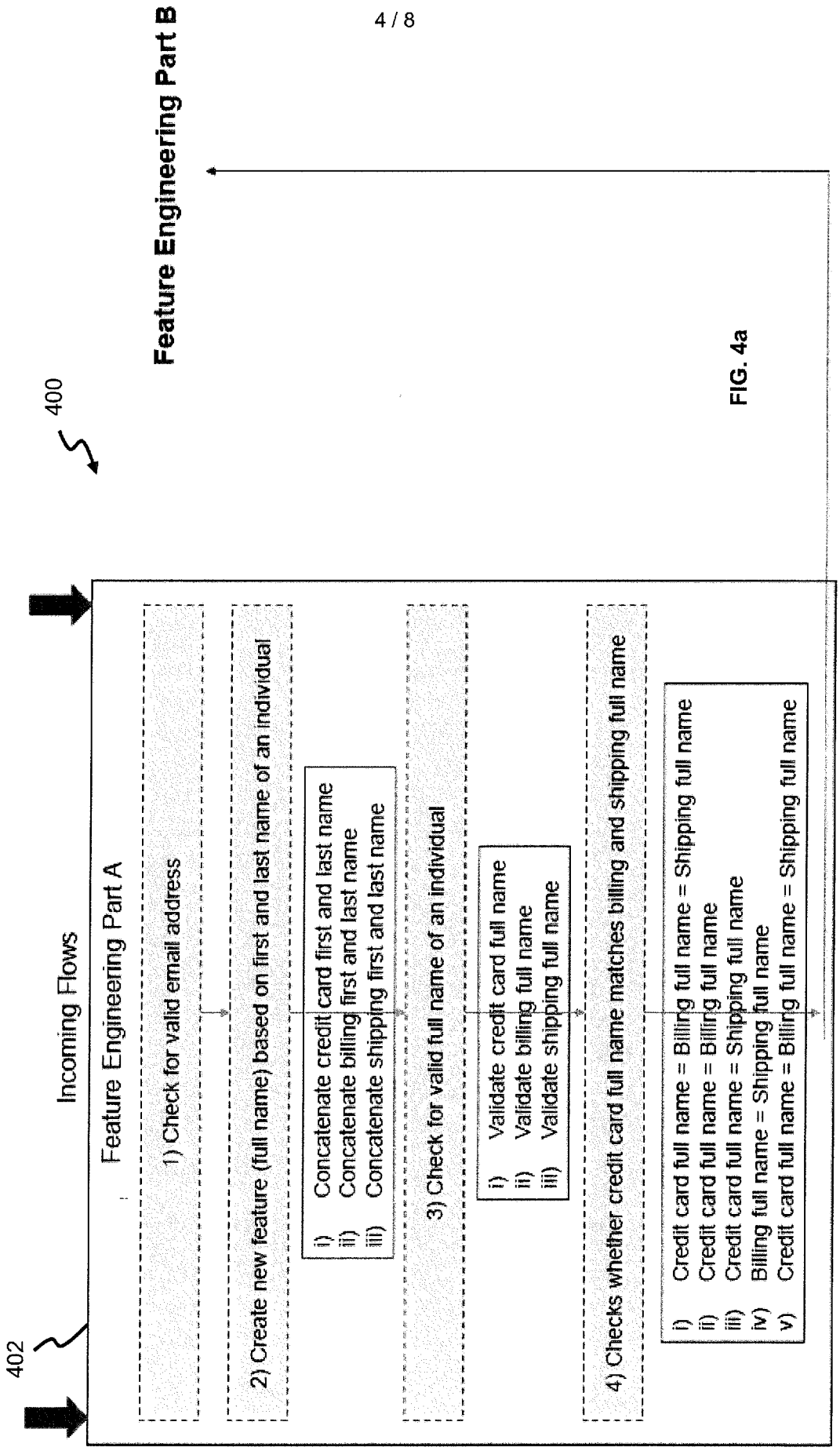

Feature Engineering Part B
400
Incoming Flows
402
Feature Engineering Part A
1) Check for valid email address
2) Create new feature (full name) based on first and last name of an individual
i) Concatenate credit card first and last name
ii) Concatenate billing first and last name
iii) Concatenate shipping first and last name
3) Check for valid full name of an individual
i) Validate credit card full name
ii) Validate billing full name
iii) Validate shipping full name
4) Checks whether credit card full name matches billing and shipping full name
i) Credit card full name = Billing full name = Shipping full name
ii) Credit card full name = Billing full name
iii) Credit card full name = Shipping full name
iv) Billing full name = Shipping full name
v) Credit card full name = Billing full name = Shipping full name

FIG. 4a

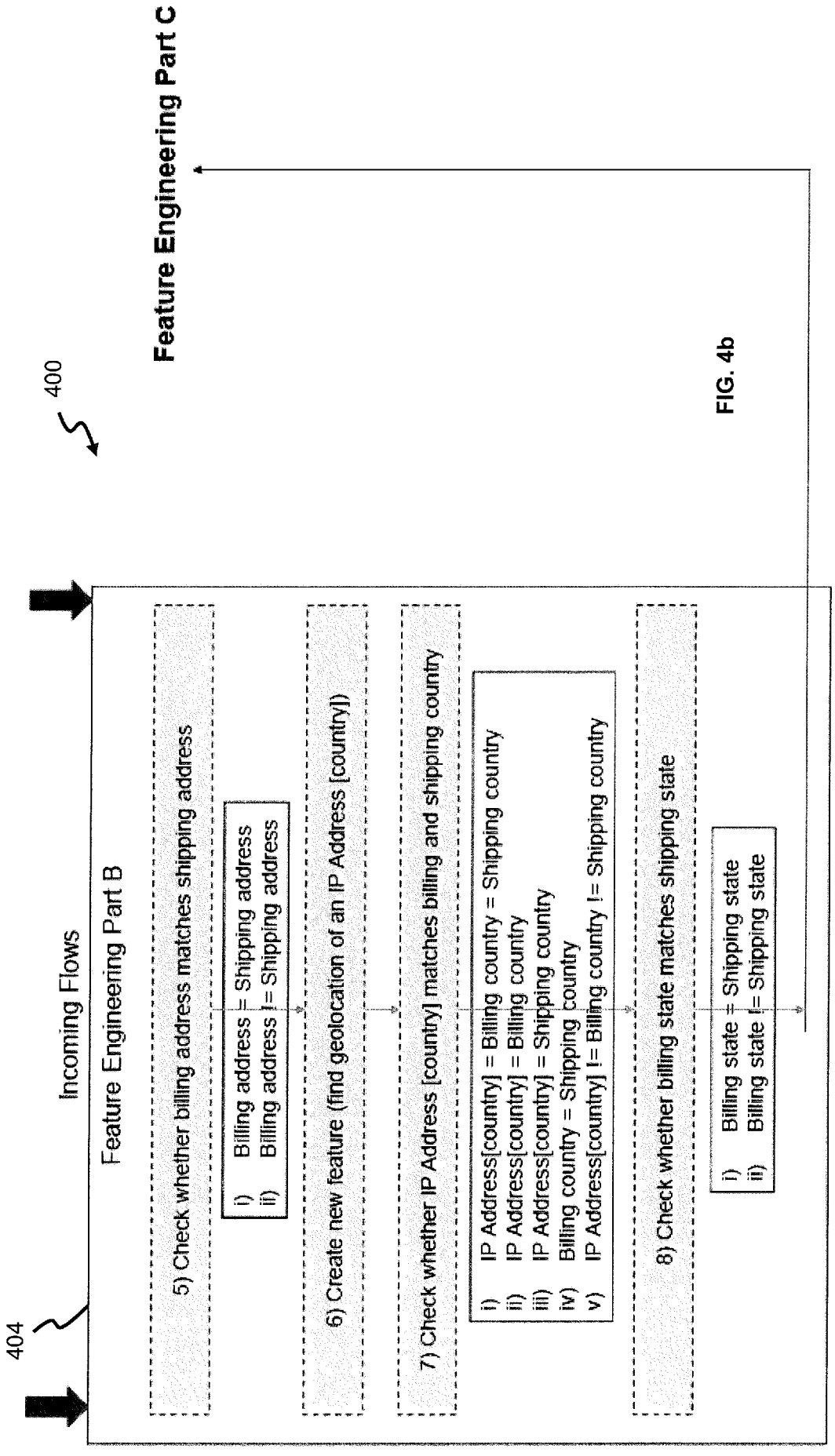

400
Feature Engineering Part C
404
Incoming Flows
Feature Engineering Part B
5) Check whether billing address matches shipping address
i) Billing address = Shipping address
ii) Billing address != Shipping address
6) Create new feature (find geolocation of an IP Address [country])
7) Check whether IP Address [country] matches billing and shipping country
i) IP Address[country] = Billing country = Shipping country
ii) IP Address[country] = Billing country
iii) IP Address[country] = Shipping country
iv) Billing country = Shipping country
v) IP Address[country] != Billing country != Shipping country
8) Check whether billing state matches shipping state
i) Billing state = Shipping state
ii) Billing state != Shipping state

FIG. 4b

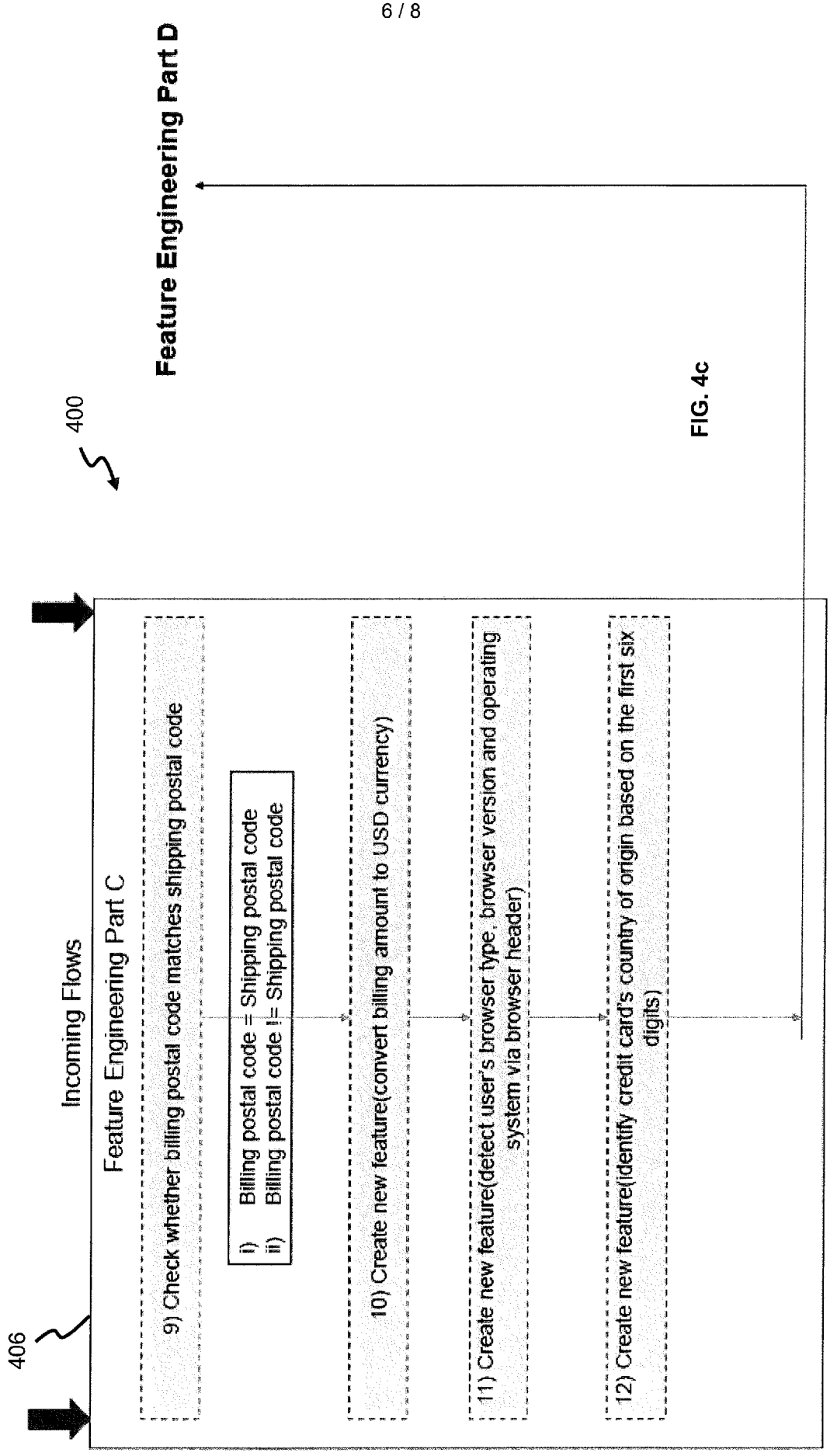

406
Incoming Flows
Feature Engineering Part C
9) Check whether billing postal code matches shipping postal code
i) Billing postal code = Shipping postal code
ii) Billing postal code != Shipping postal code
10) Create new feature(convert billing amount to USD currency)
11) Create new feature(detect user's browser type, browser version and operating system via browser header)
12) Create new feature(identify credit card's country of origin based on the first six digits)
400
Feature Engineering Part D

FIG. 4c

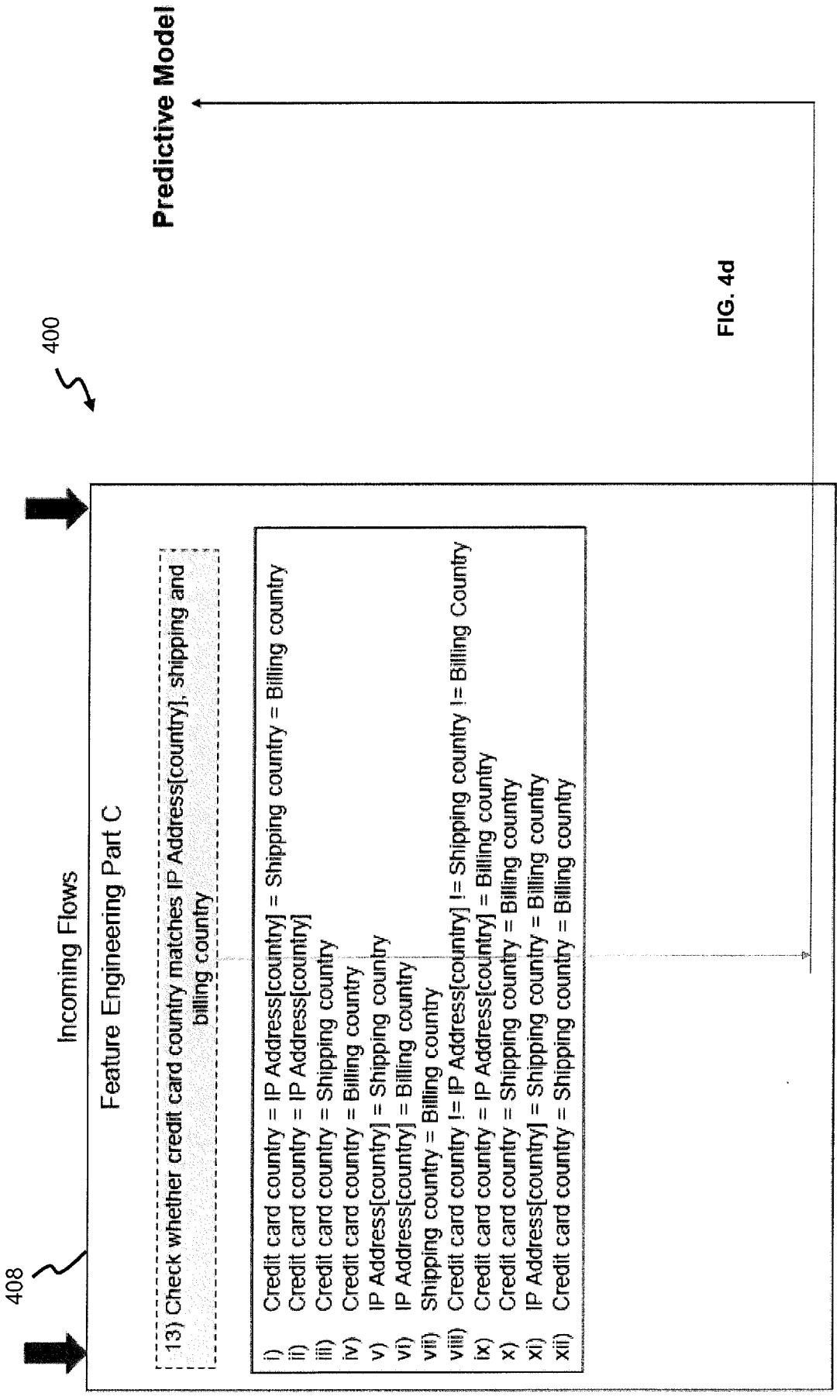

Predictive Model
400
408
Incoming Flows
Feature Engineering Part C
13) Check whether credit card country matches IP Address[country], shipping and billing country
i) Credit card country = IP Address[country] = Shipping country = Billing country
ii) Credit card country = IP Address[country]
iii) Credit card country = Shipping country
iv) Credit card country = Billing country
v) IP Address[country] = Shipping country
vi) IP Address[country] = Billing country
vii) Shipping country = Billing country
viii) Credit card country != IP Address[country] != Shipping country != Billing Country
ix) Credit card country = IP Address[country] = Billing country
x) Credit card country = Shipping country = Billing country
xi) IP Address[country] = Shipping country = Billing country
xii) Credit card country = Shipping country = Billing country

FIG. 4d

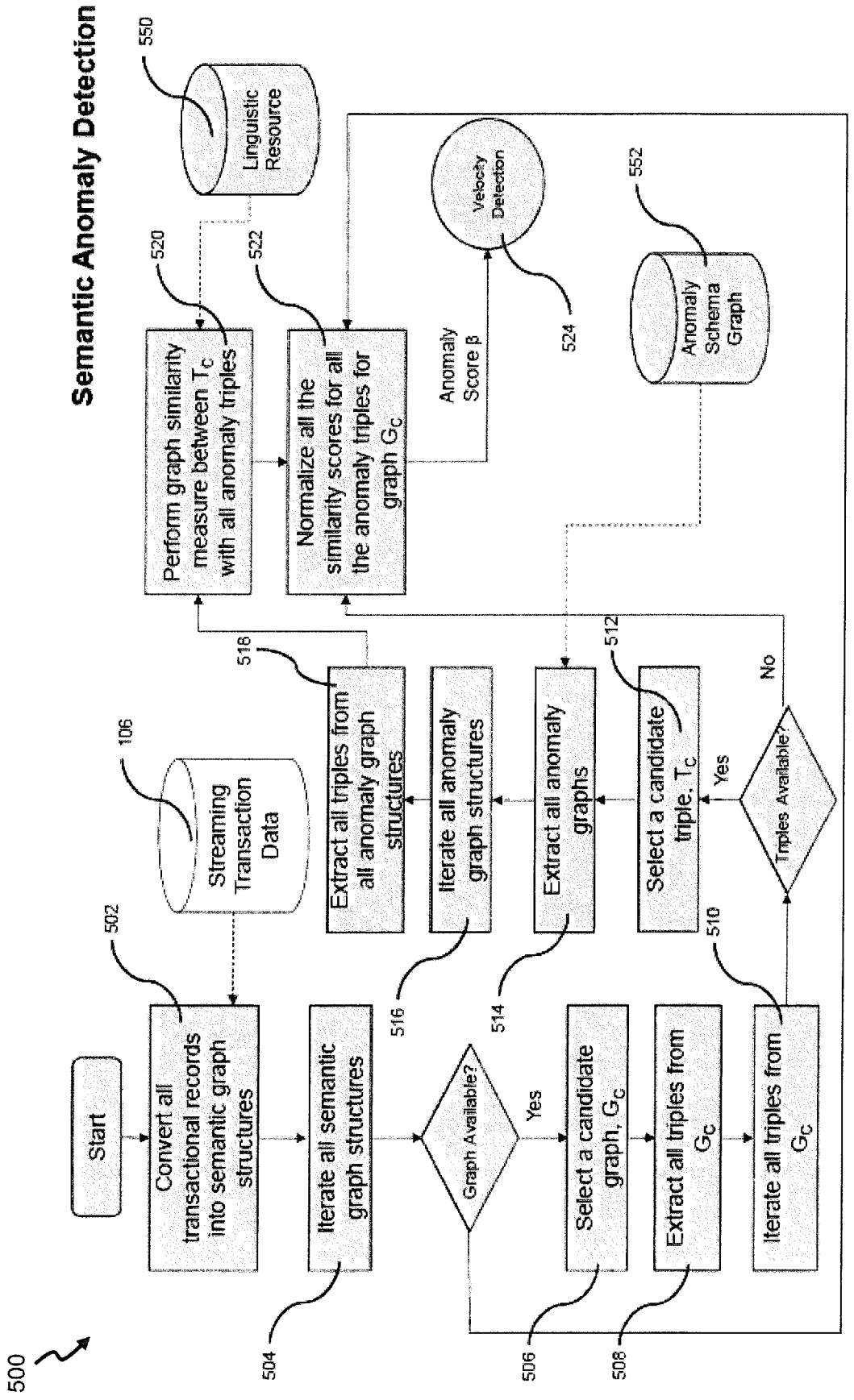

Semantic Anomaly Detection
500
Start
Convert all transactional records into semantic graph structures
502
Streaming Transaction Data
106
Iterate all semantic graph structures
504
Graph Available?
Yes
Select a candidate graph, G_c
506
Extract all triples from G_c
508
Iterate all triples from G_c
510
Triples Available?
No
Yes
Select a candidate triple, T_c
512
Extract all anomaly graphs
514
Iterate all anomaly graph structures
516
Extract all triples from all anomaly graph structures
518
Linguistic Resource
550
Perform graph similarity measure between T_c with all anomaly triples
520
Normalize all the similarity scores for all the anomaly triples for graph G_c
522
Anomaly Score β
Velocity Detection
524
Anomaly Schema Graph
552

FIG. 5