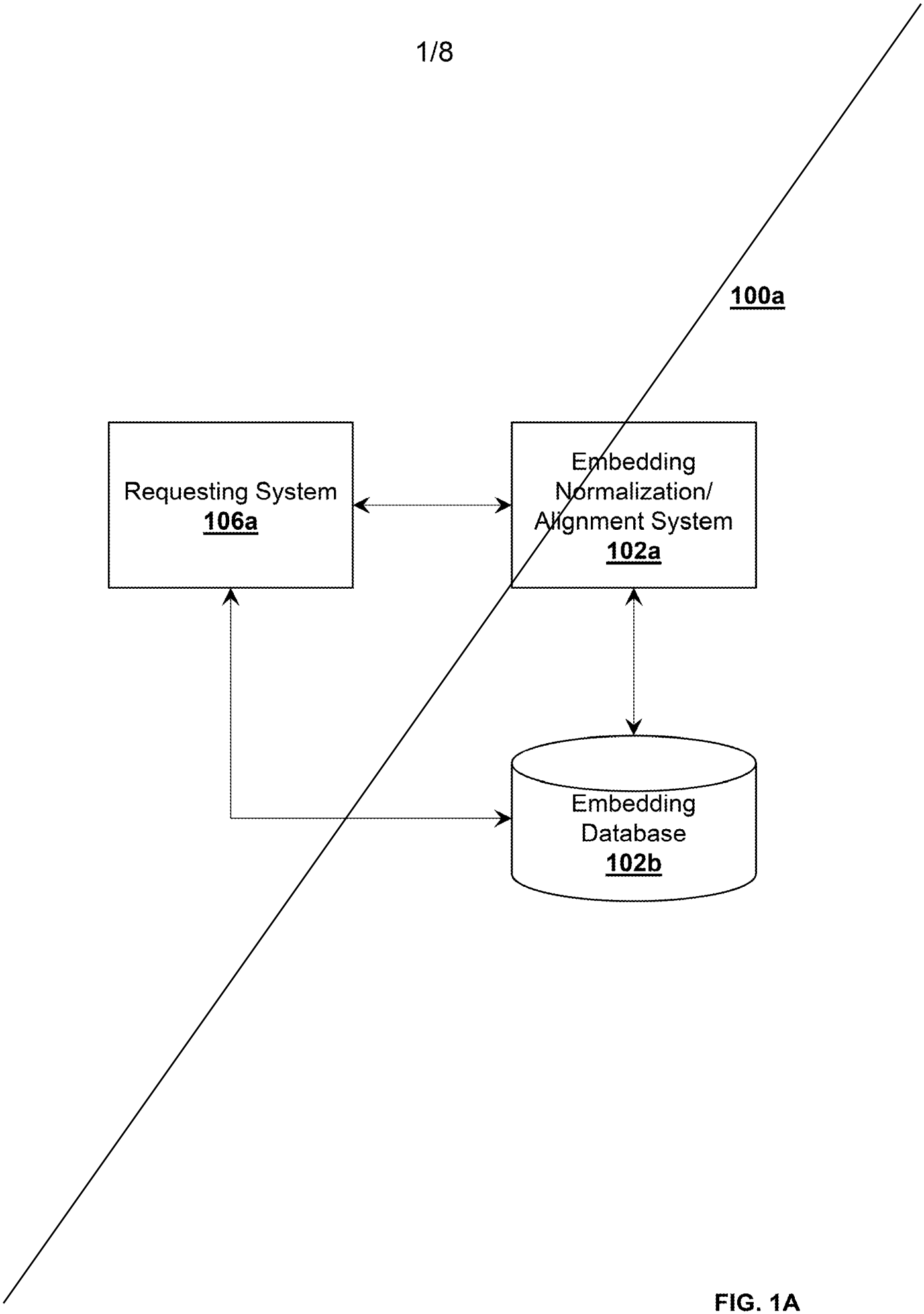

100a
Requesting System
106a
Embedding
Normalization/
Alignment System
102a
Embedding
Database
102b

FIG. 1A

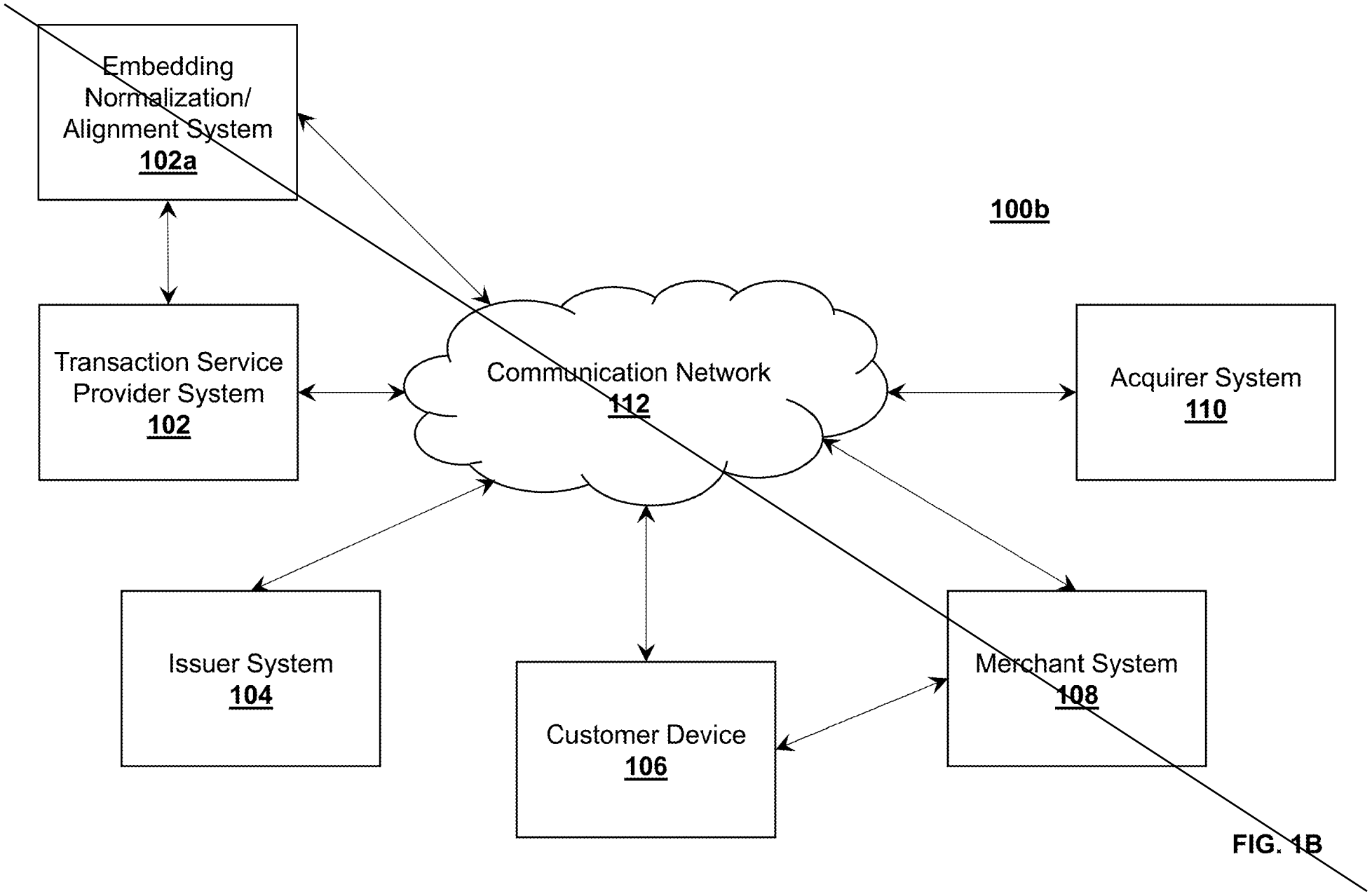

Embedding Normalization/ Alignment System
102a
100b
Transaction Service Provider System
102
Communication Network
112
Acquirer System
110
Issuer System
104
Customer Device
106
Merchant System
108

FIG. 1B

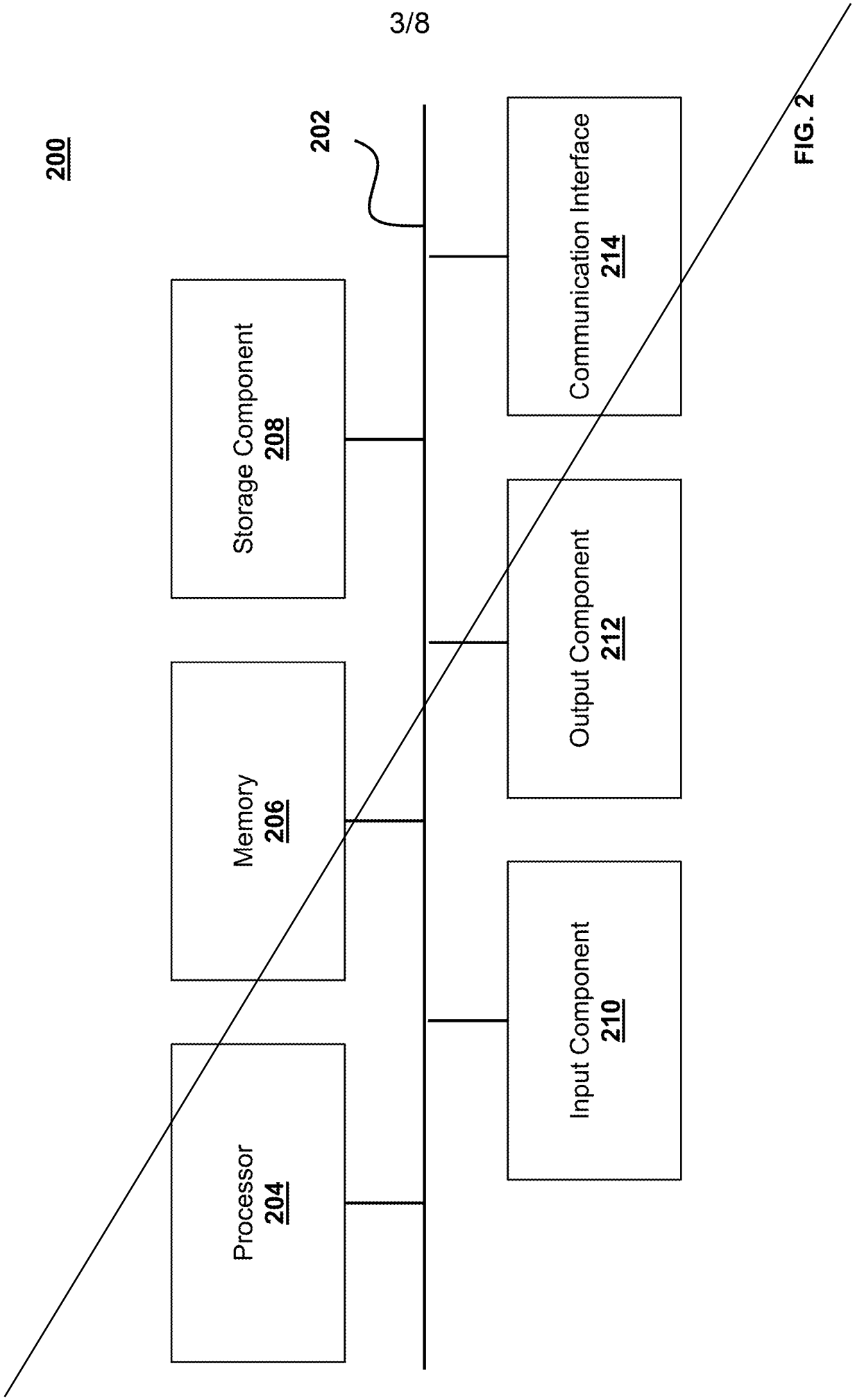

200
202
Processor
204
Memory
206
Storage Component
208
Input Component
210
Output Component
212
Communication Interface
214

FIG. 2

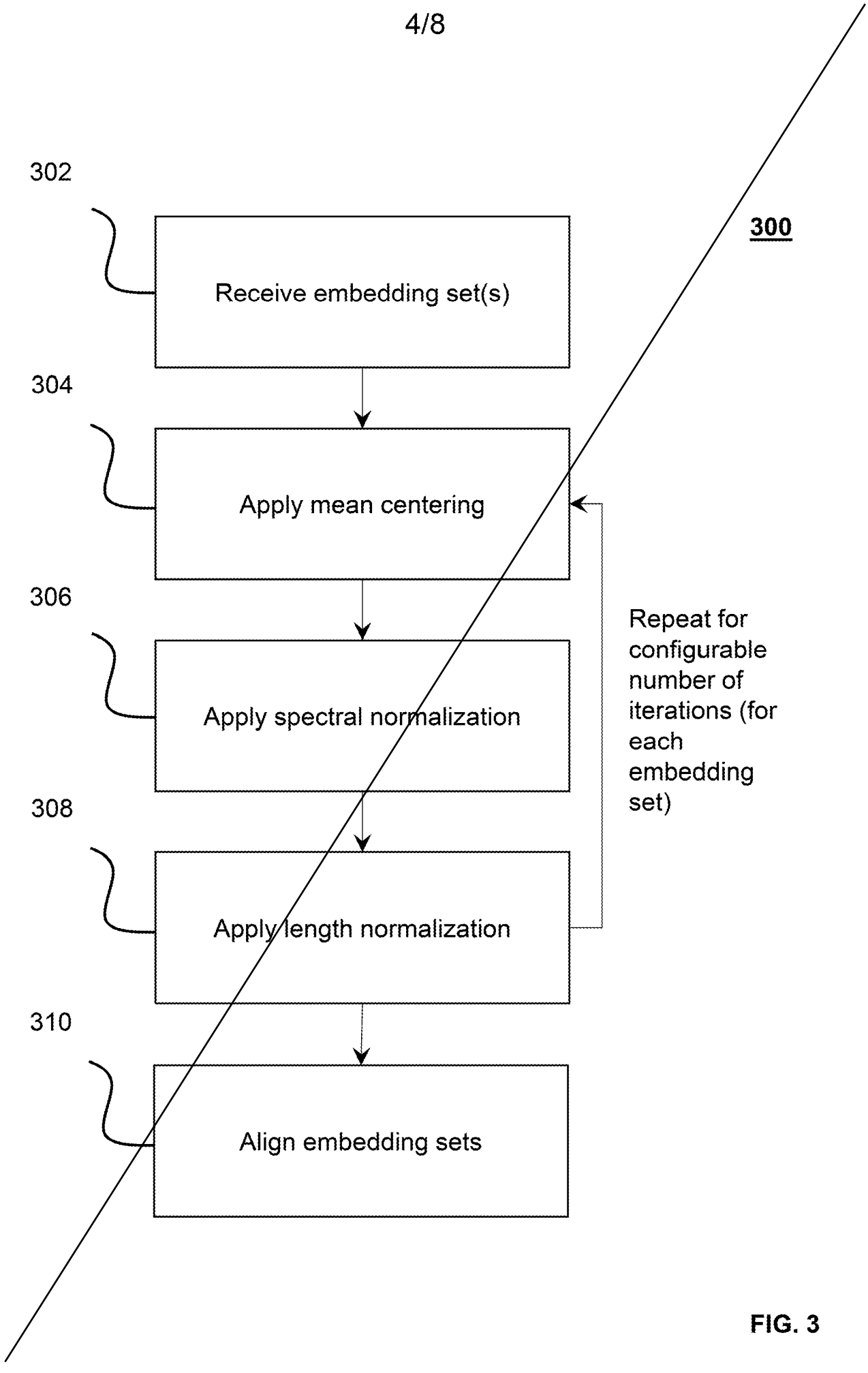

300
302
Receive embedding set(s)
304
Apply mean centering
306
Apply spectral normalization
308
Apply length normalization
310
Align embedding sets
Repeat for configurable number of iterations (for each embedding set)

FIG. 3

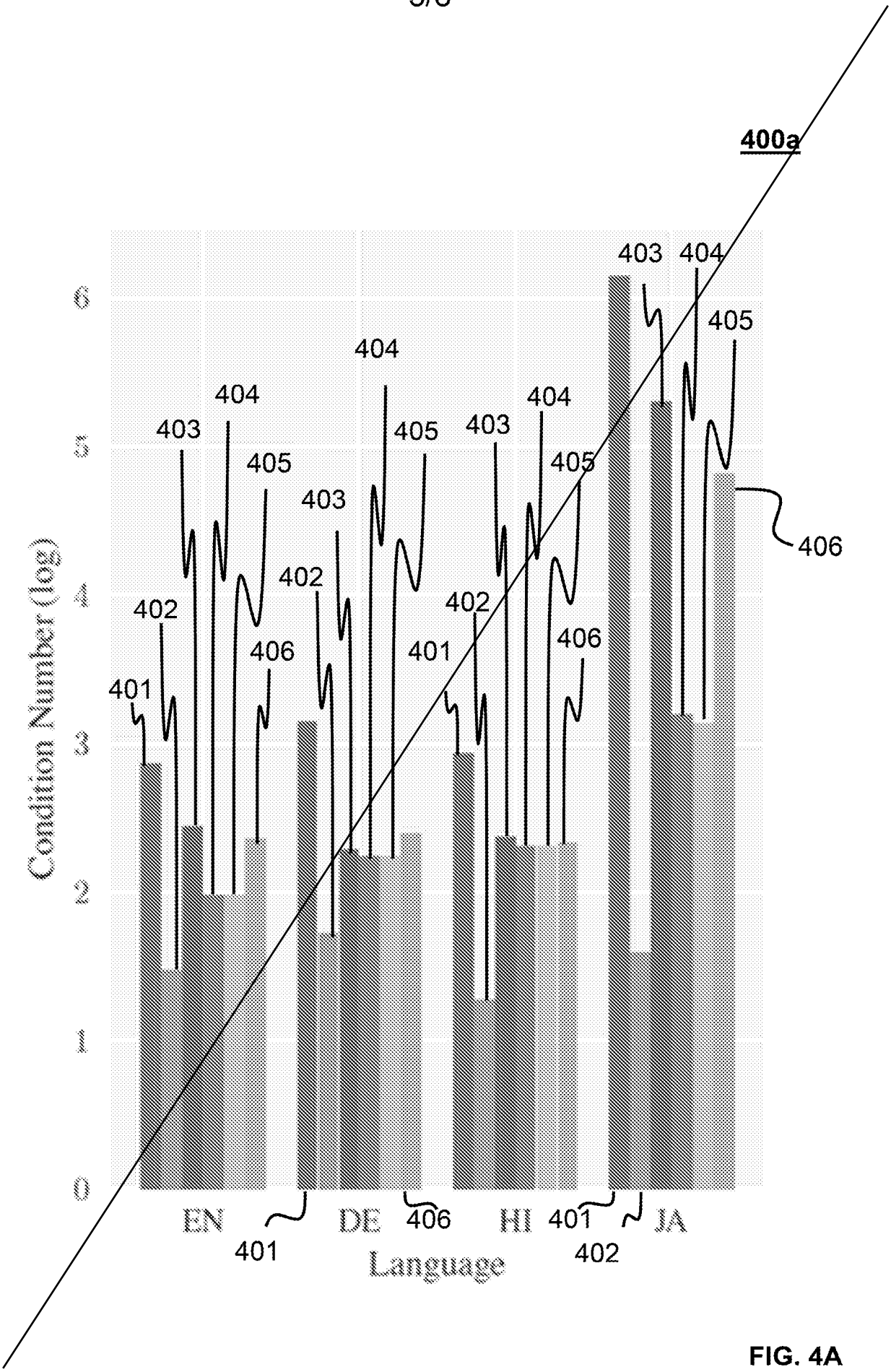

400a
Condition Number (log)
0
1
2
3
4
5
6
EN
DE
HI
JA
Language
401
402
403
404
405
406

FIG. 4A

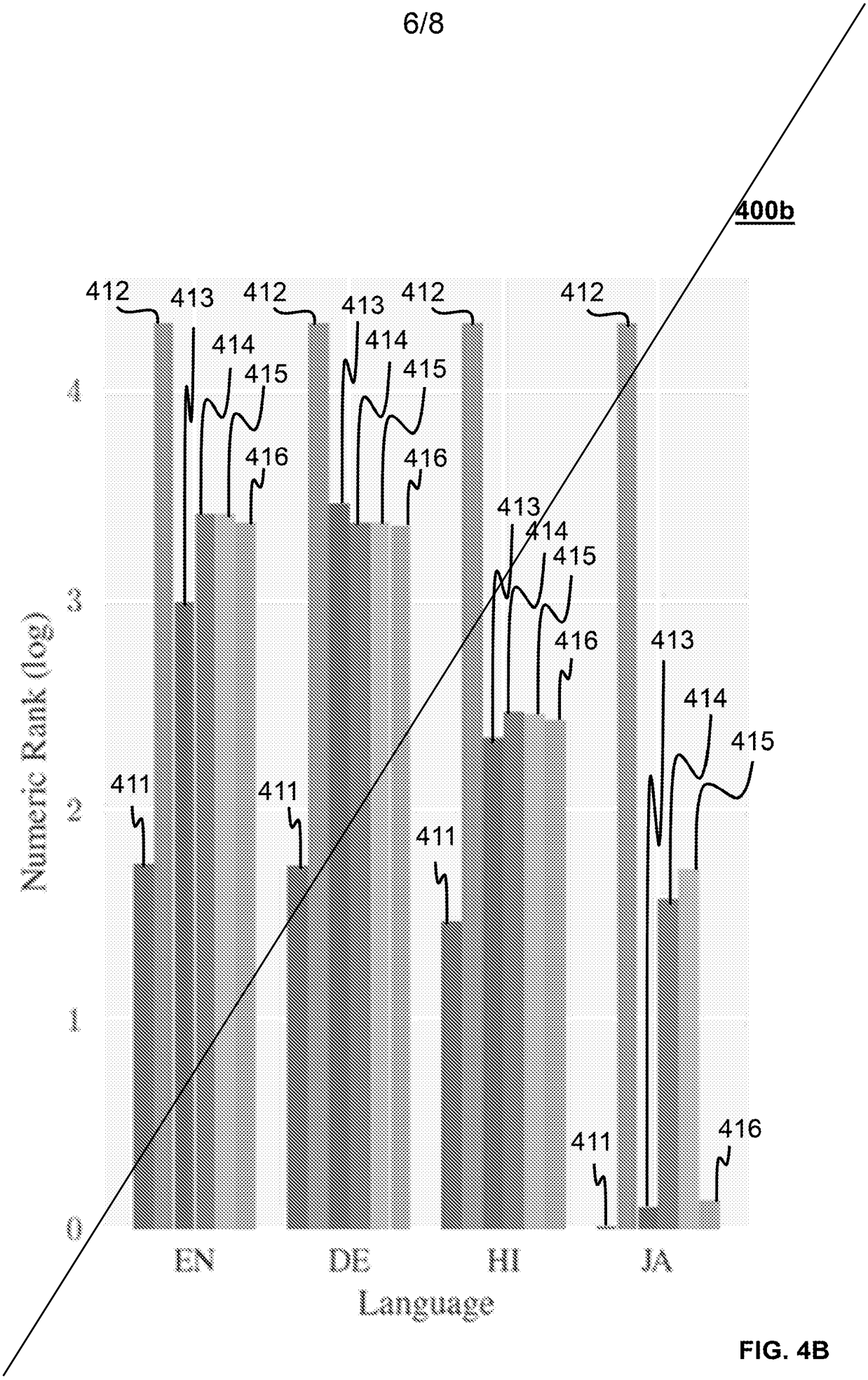

400b
412
413
414
415
416
411
Numeric Rank (log)
0
1
2
3
4
EN
DE
HI
JA
Language

FIG. 4B

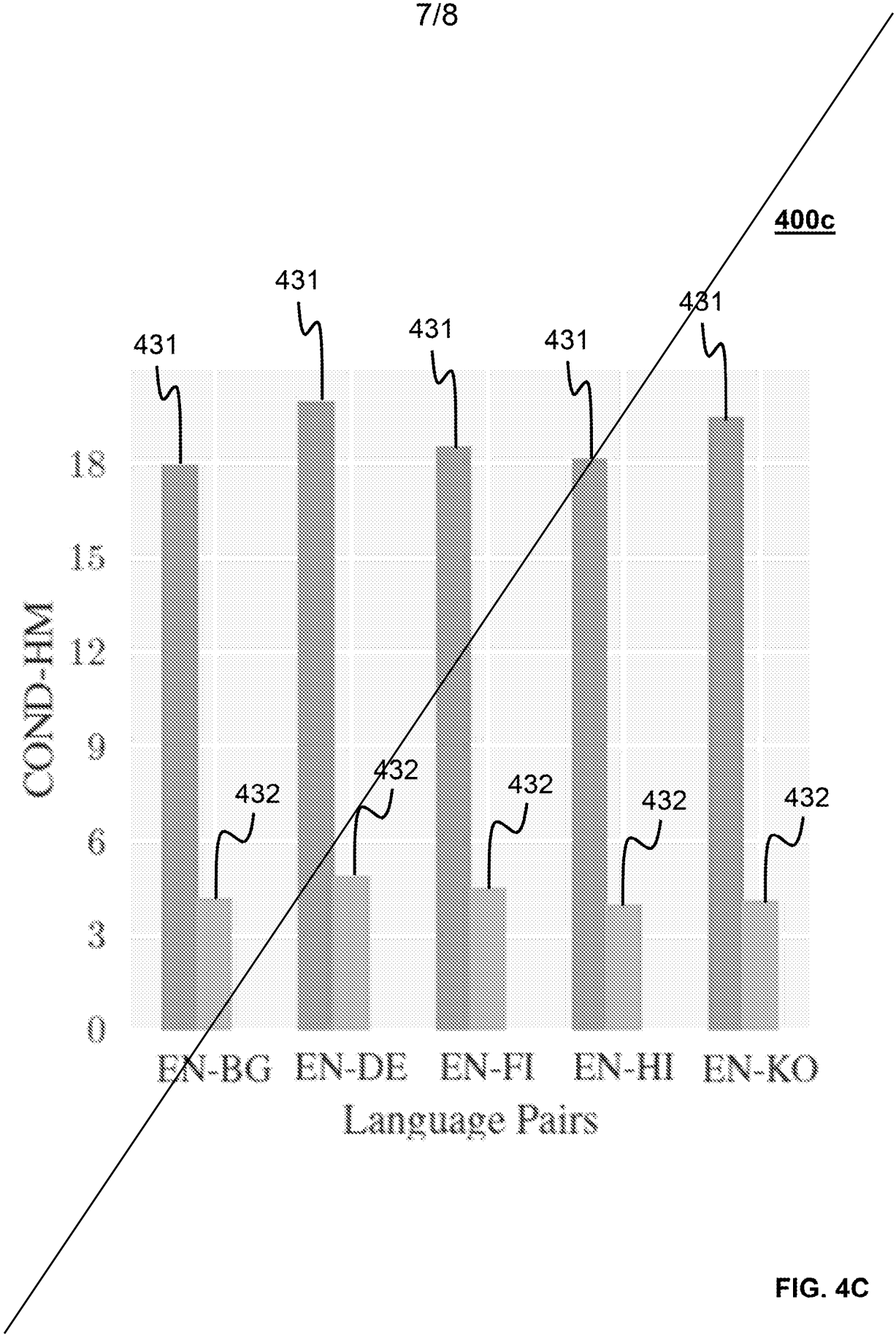

400c
431
431
431
431
431
432
432
432
432
432
18
15
12
9
6
3
0
COND-HM
EN-BG
EN-DE
EN-FI
EN-HI
EN-KO
Language Pairs

FIG. 4C

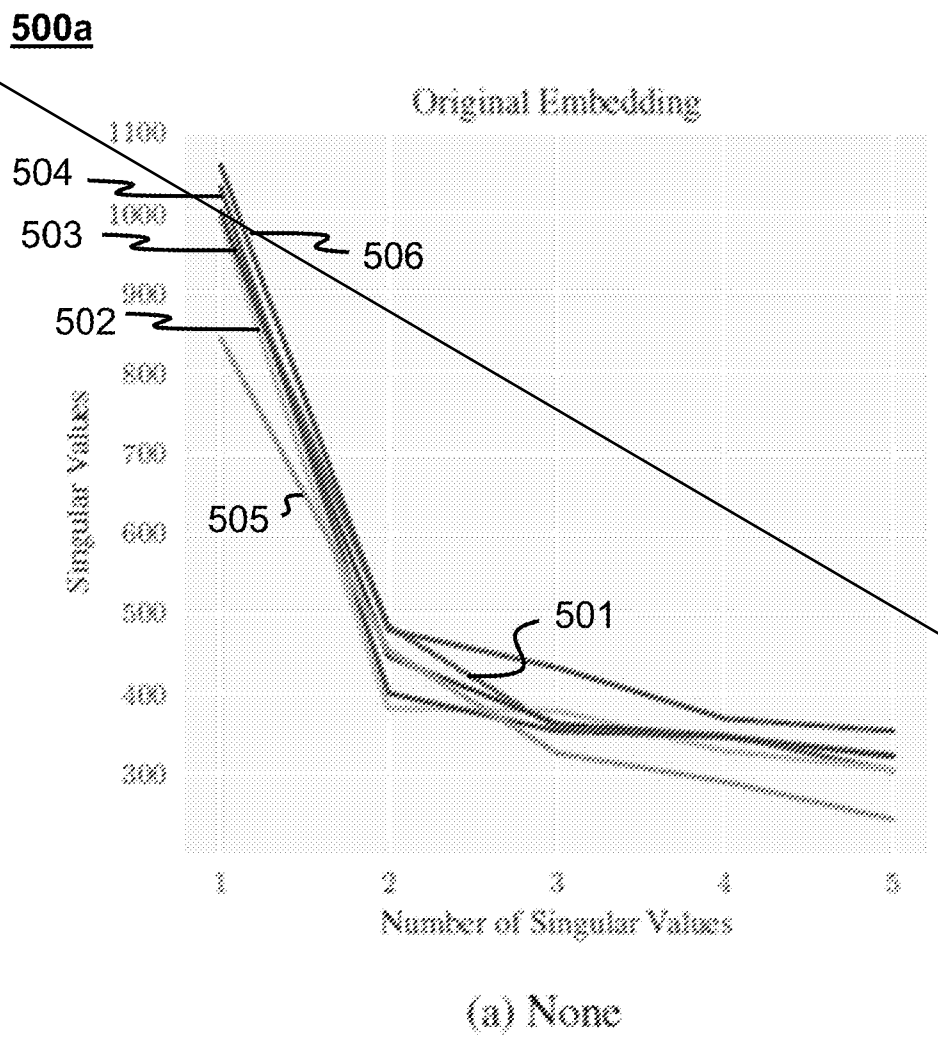

500a
Original Embedding
Singular Values
Number of Singular Values
504
503
502
506
505
501
1100
1000
900
800
700
600
500
400
300
1
2
3
4
5
(a) None

FIG. 5A

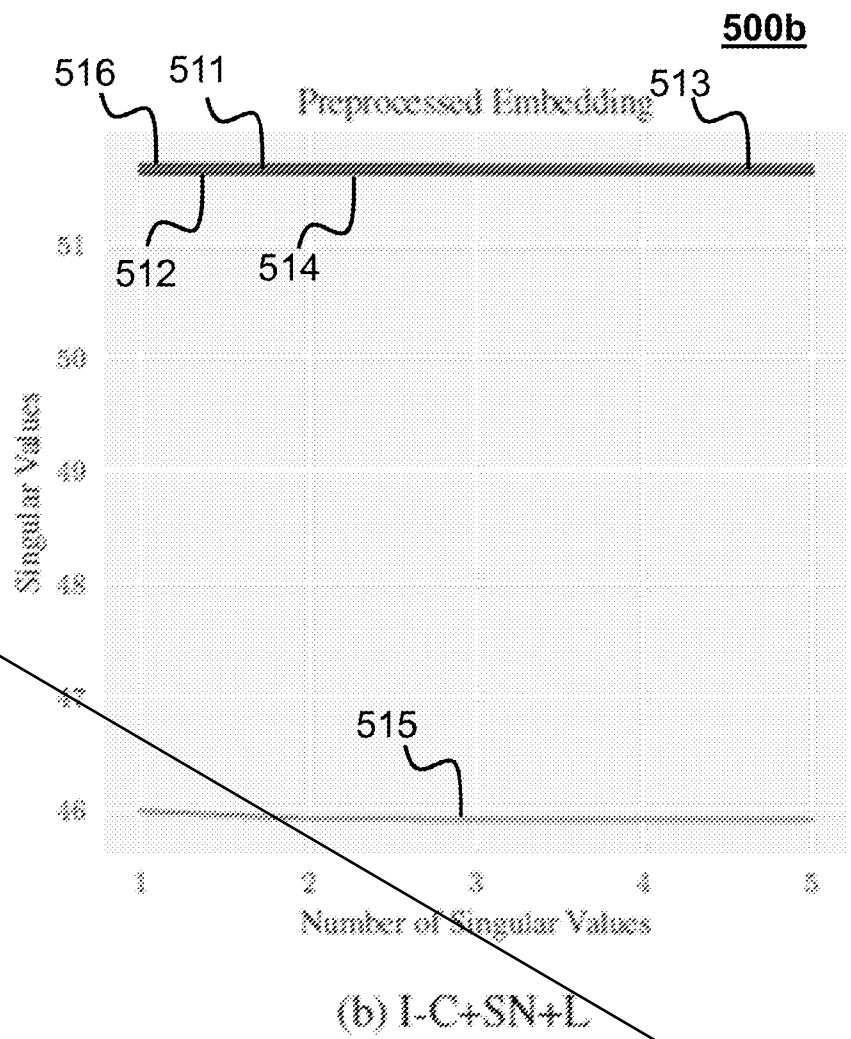

500b
Preprocessed Embedding
Singular Values
Number of Singular Values
516
511
513
512
514
515
51
50
49
48
47
46
1
2
3
4
5
(b) I-C+SN+L

FIG. 5B

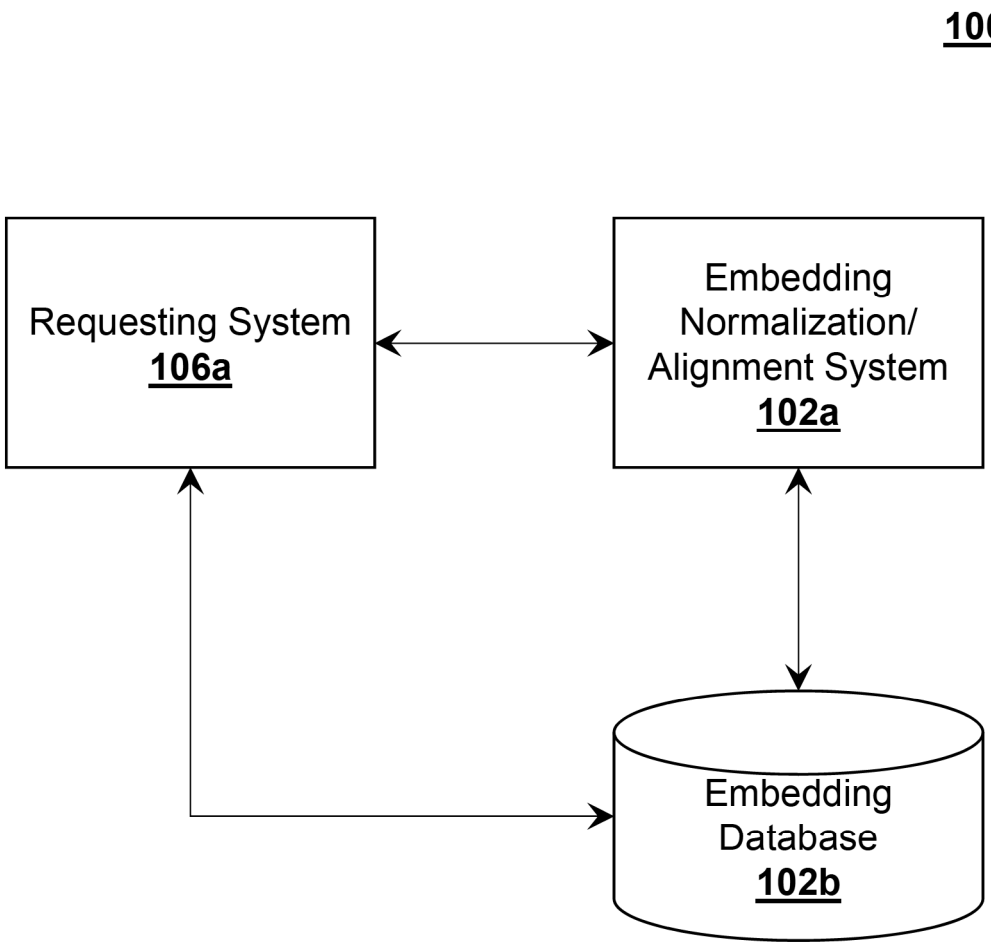

100a
Requesting System
106a
Embedding
Normalization/
Alignment System
102a
Embedding
Database
102b

FIG. 1A

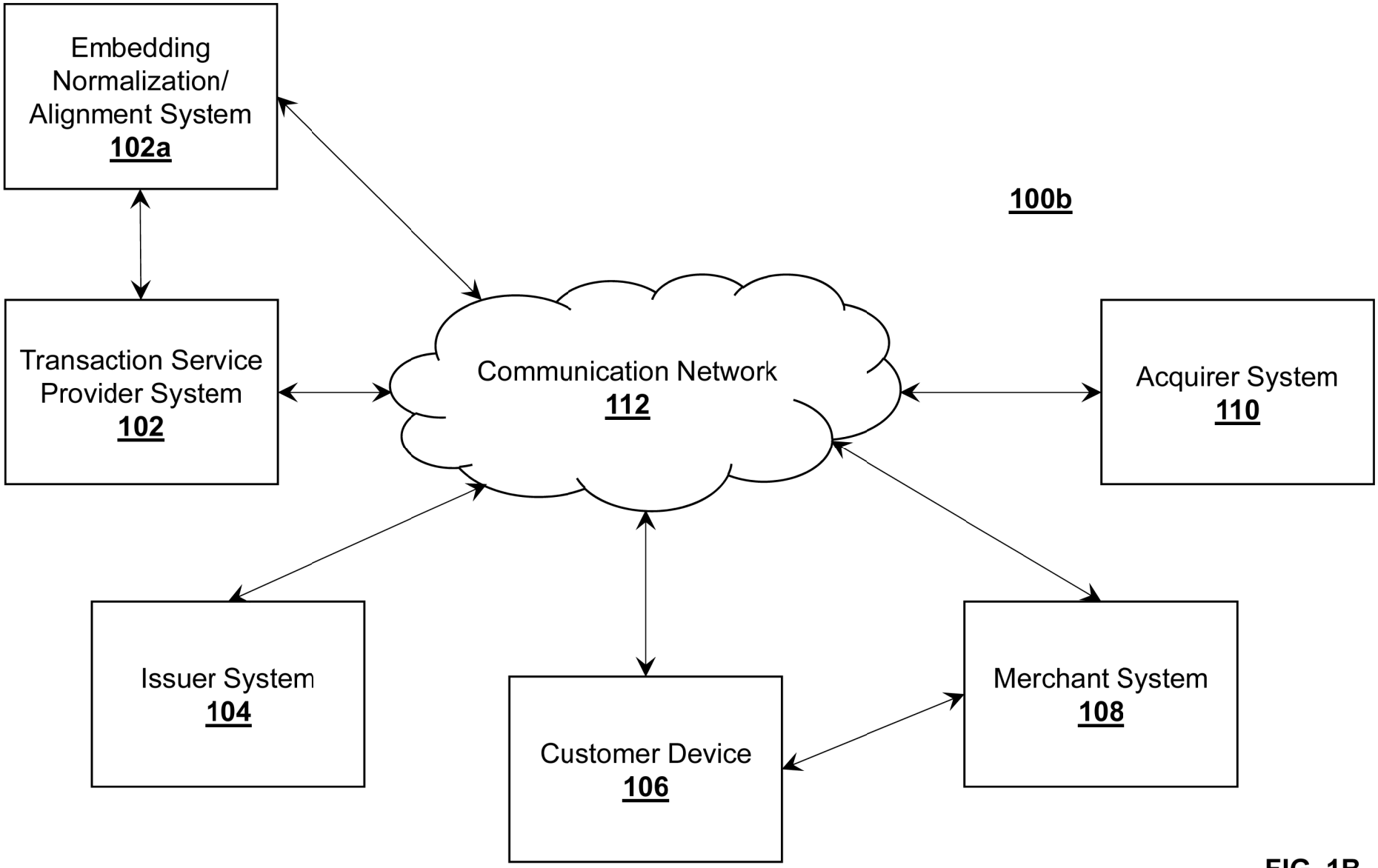

Embedding Normalization/ Alignment System
102a
100b
Transaction Service Provider System
102
Communication Network
112
Acquirer System
110
Issuer System
104
Customer Device
106
Merchant System
108

FIG. 1B

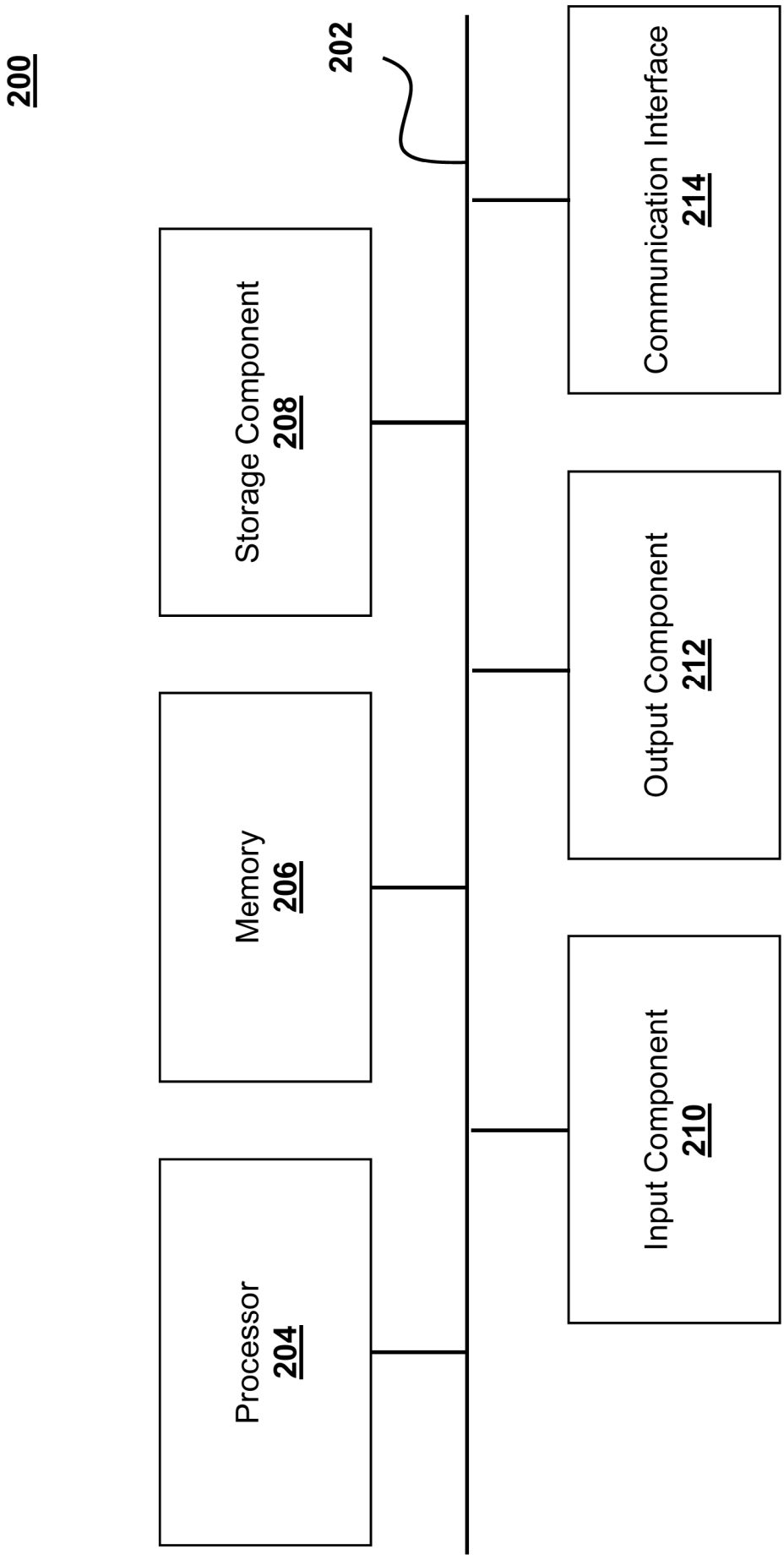

200
202
Processor
204
Memory
206
Storage Component
208
Input Component
210
Output Component
212
Communication Interface
214

FIG. 2

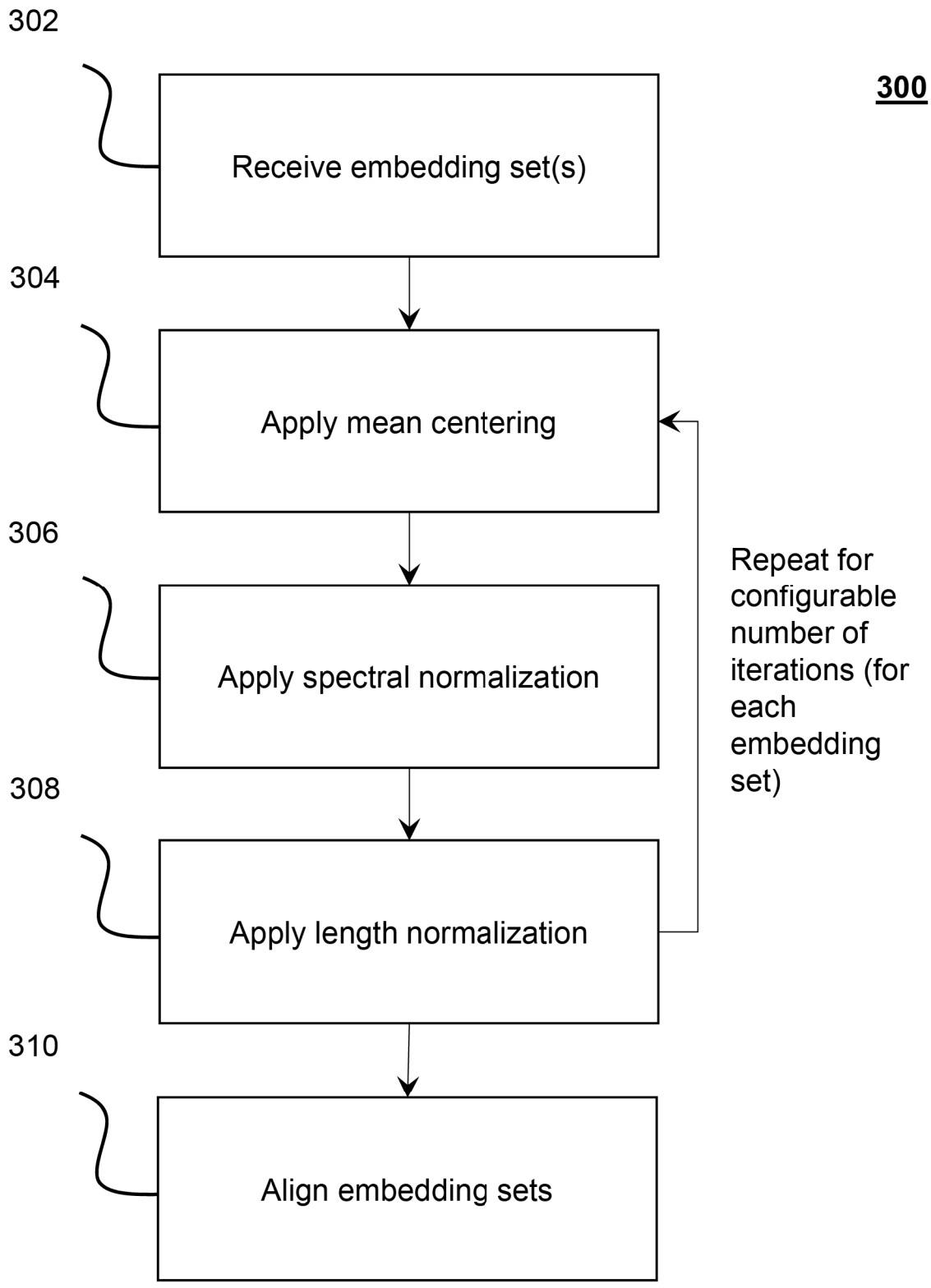

302
300
Receive embedding set(s)
304
Apply mean centering
306
Apply spectral normalization
308
Apply length normalization
310
Align embedding sets
Repeat for configurable number of iterations (for each embedding set)

FIG. 3

400a

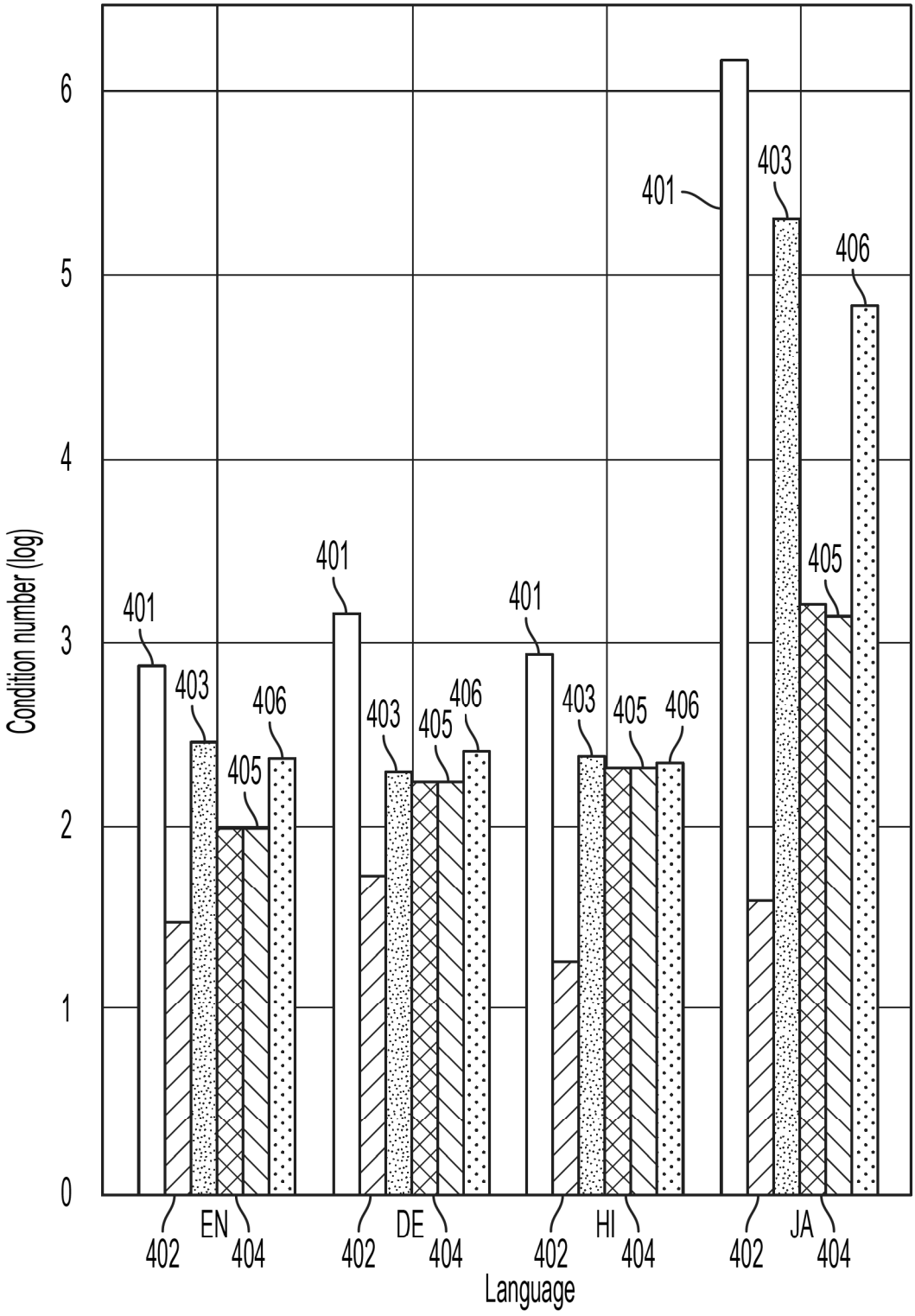

Condition number (log)
0
1
2
3
4
5
6
401
403
405
406
402
404
EN
DE
HI
JA
Language

FIG. 4A

400b

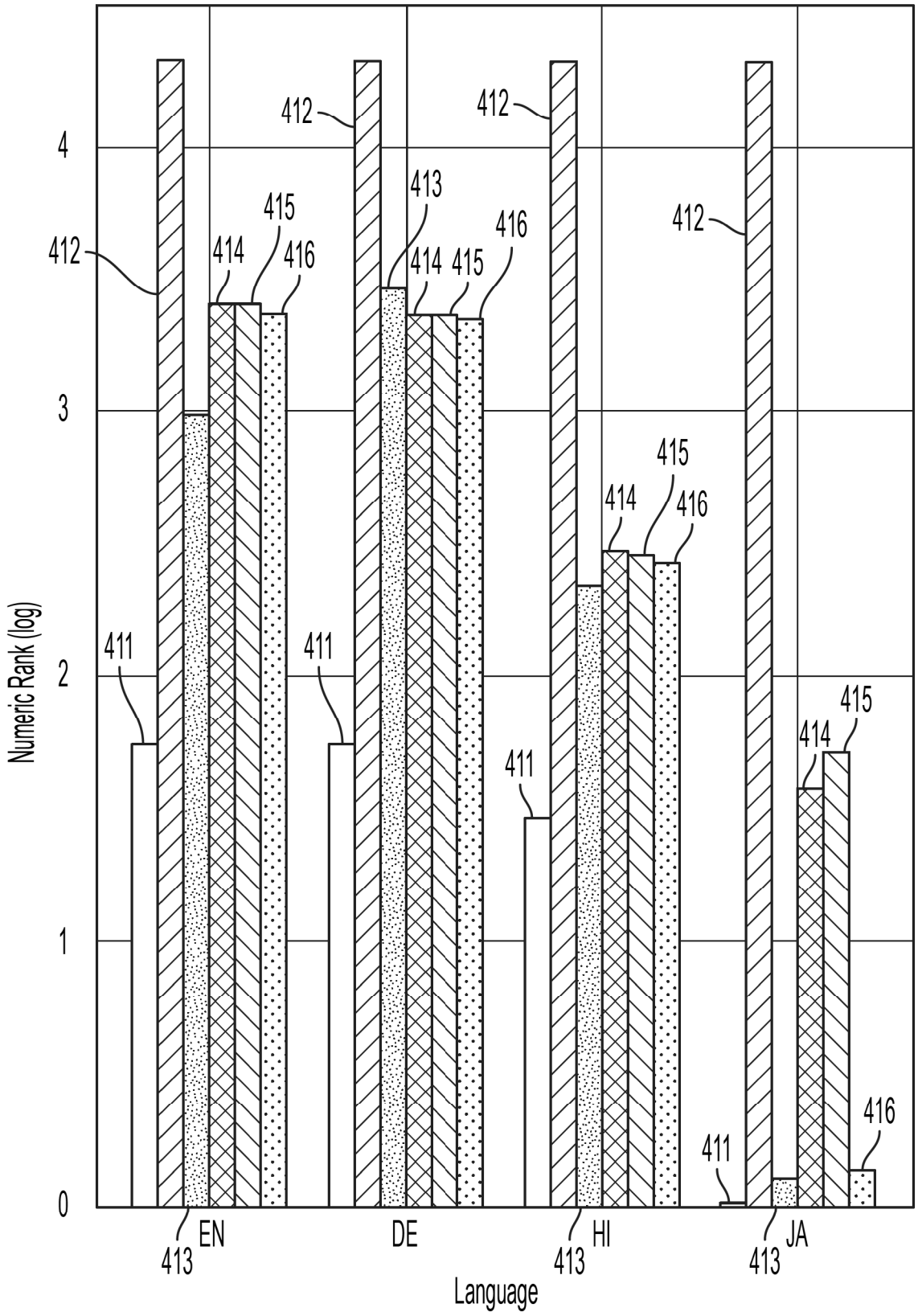

Numeric Rank (log)
4
3
2
1
0
412
411
413
414
415
416
EN
DE
HI
JA
Language

FIG. 4B

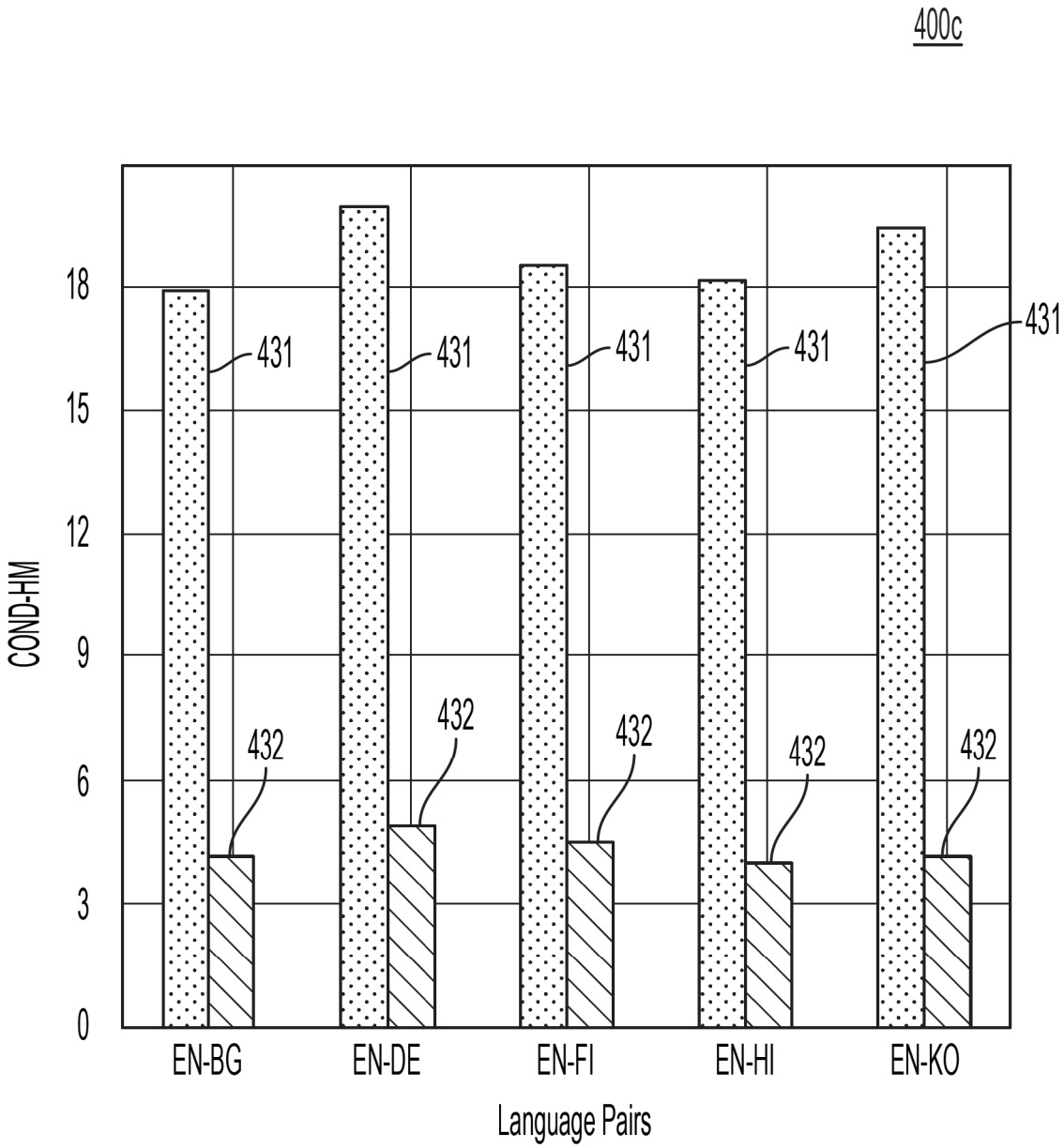

400c
COND-HM
18
15
12
9
6
3
0
431
432
EN-BG
EN-DE
EN-FI
EN-HI
EN-KO
Language Pairs

FIG. 4C

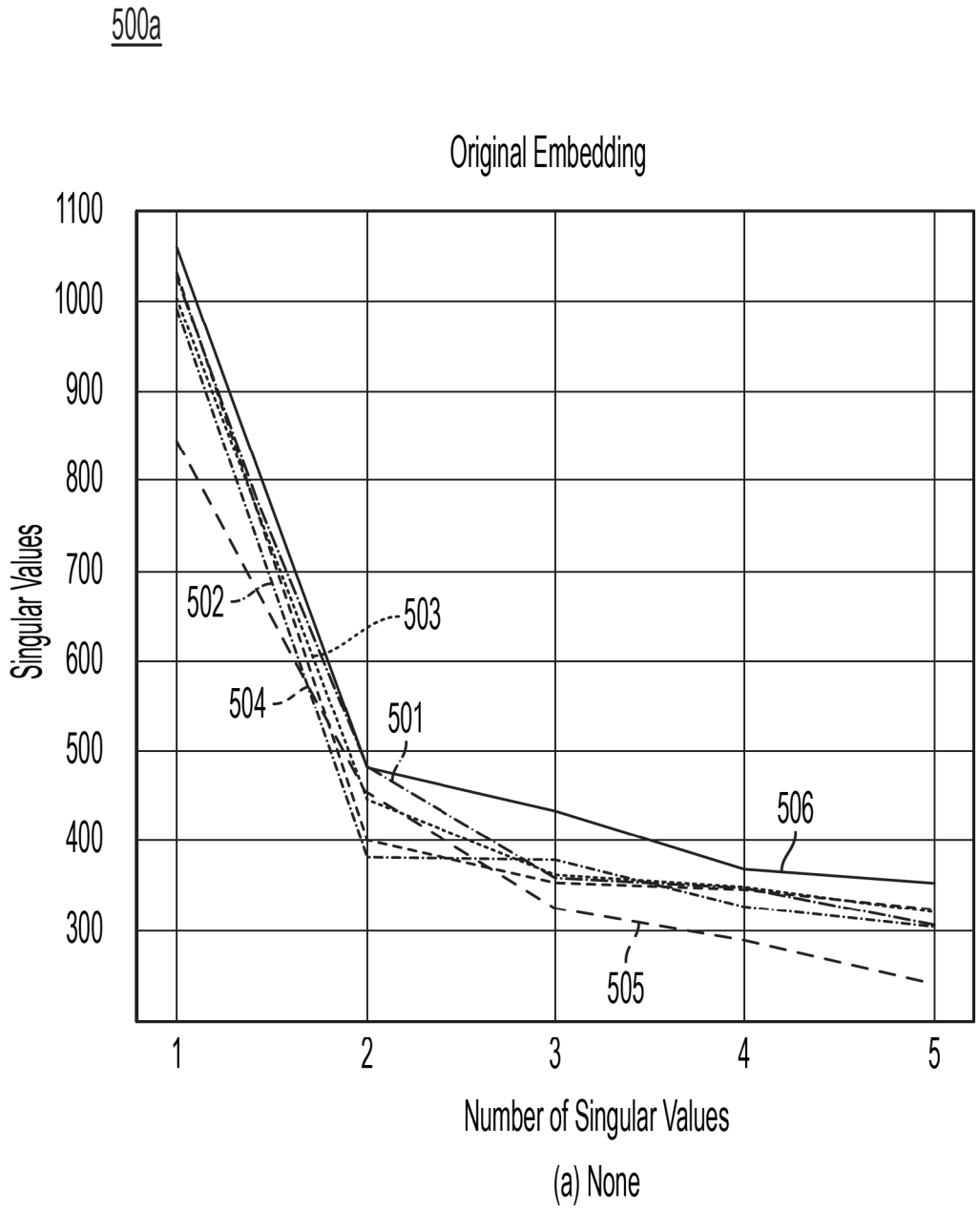

500a
Original Embedding
1100
1000
900
800
700
600
500
400
300
Singular Values
502
503
504
501
506
505
1
2
3
4
5
Number of Singular Values
(a) None

FIG. 5A

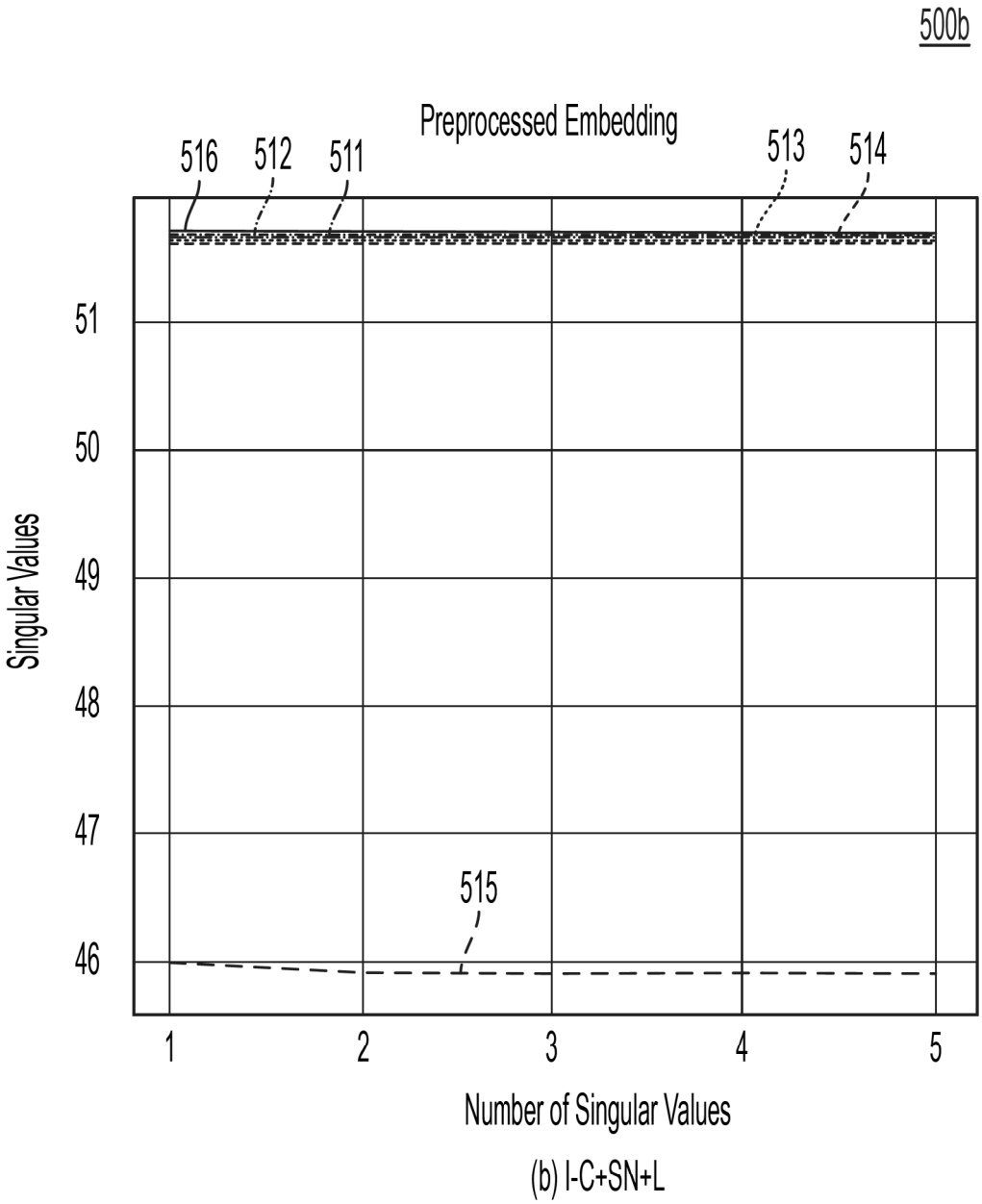

500b
Preprocessed Embedding
516
512
511
513
514
515
51
50
49
48
47
46
Singular Values
1
2
3
4
5
Number of Singular Values
(b) I-C+SN+L

FIG. 5B