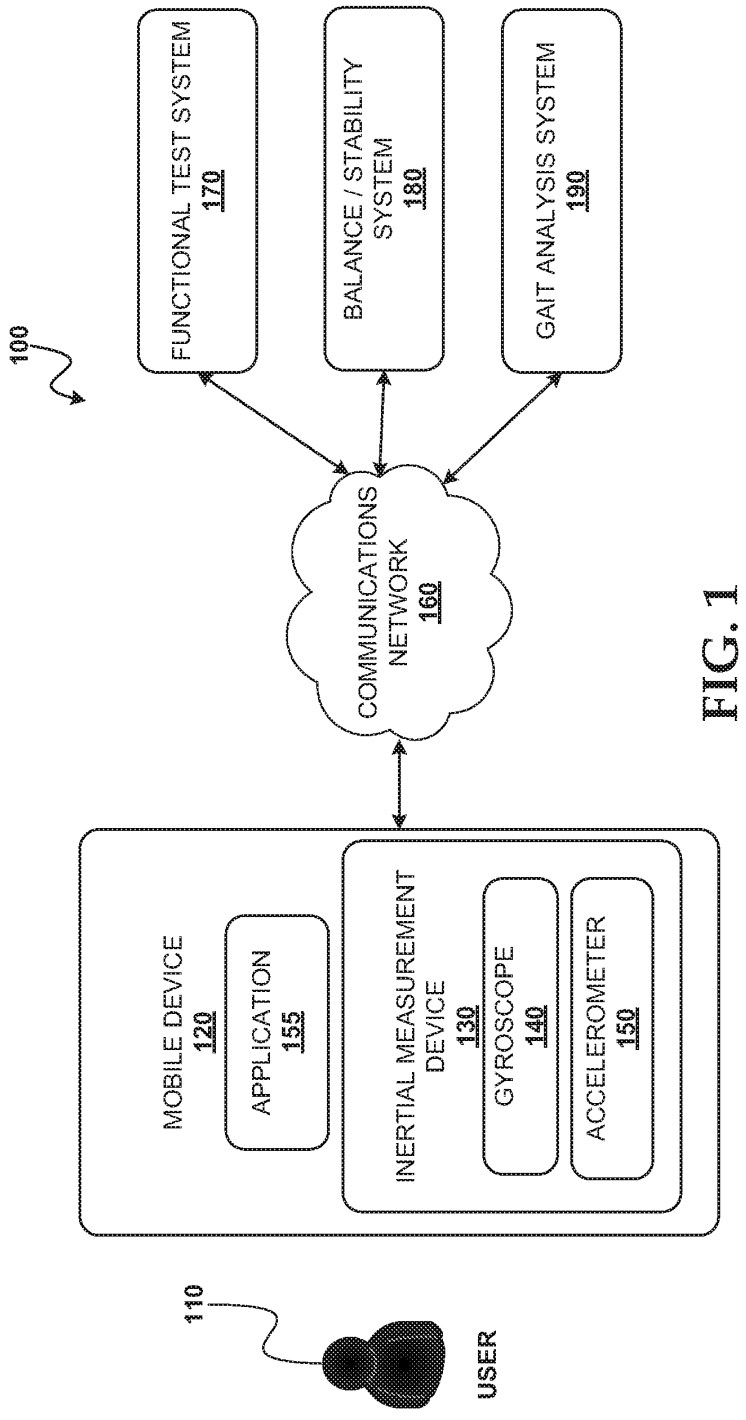
100
FUNCTIONAL TEST SYSTEM
170
BALANCE / STABILITY SYSTEM
180
GAIT ANALYSIS SYSTEM
190
COMMUNICATIONS NETWORK
160
MOBILE DEVICE
120
APPLICATION
155
INERTIAL MEASUREMENT DEVICE
130
GYROSCOPE
140
ACCELEROMETER
150
110
USER

FIG. 1

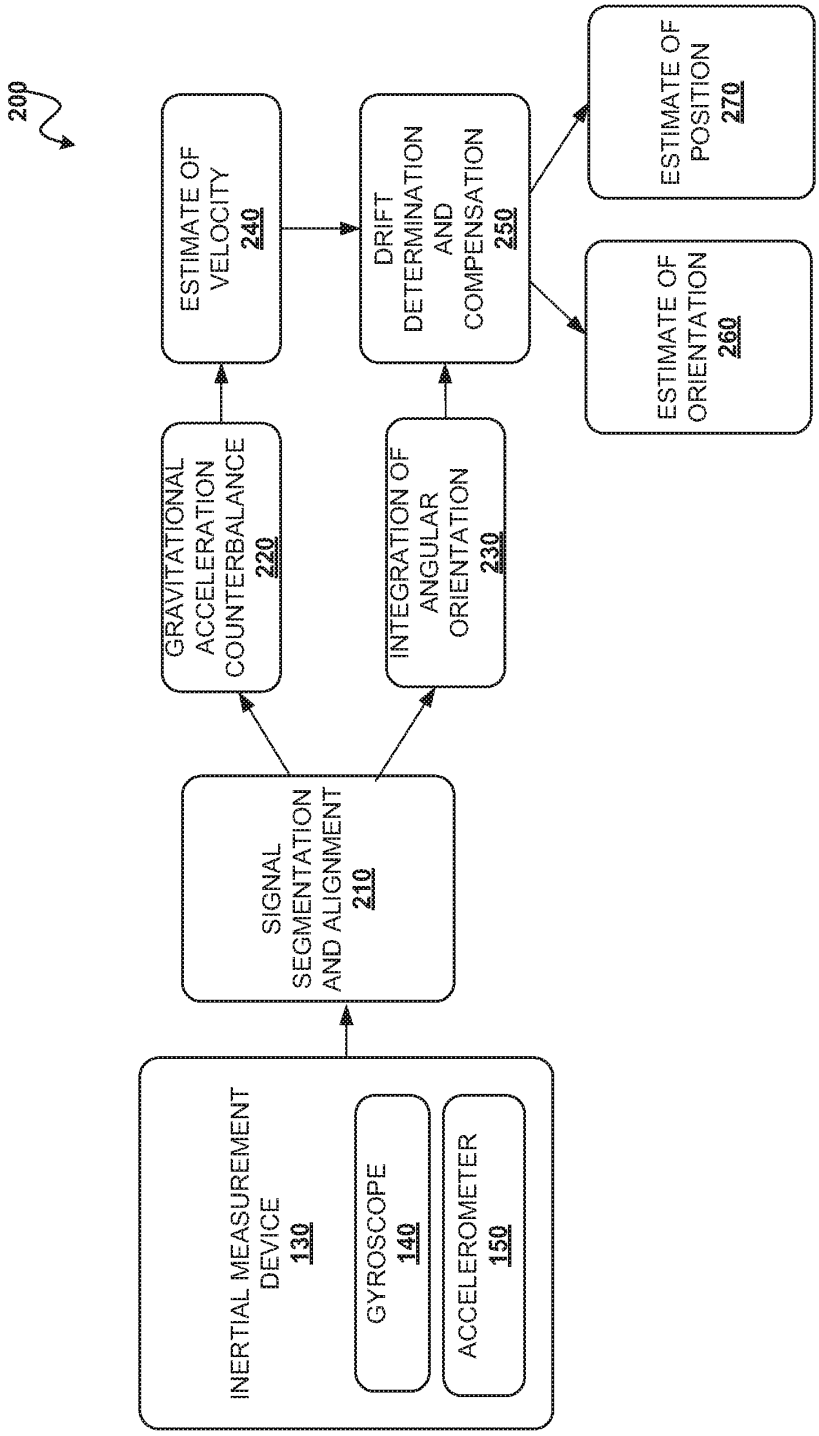
200
INERTIAL MEASUREMENT DEVICE 130
GYROSCOPE 140
ACCELEROMETER 150
SIGNAL SEGMENTATION AND ALIGNMENT 210
GRAVITATIONAL ACCELERATION COUNTERBALANCE 220
INTEGRATION OF ANGULAR ORIENTATION 230
ESTIMATE OF VELOCITY 240
DRIFT DETERMINATION AND COMPENSATION 250
ESTIMATE OF ORIENTATION 260
ESTIMATE OF POSITION 270

FIG. 2

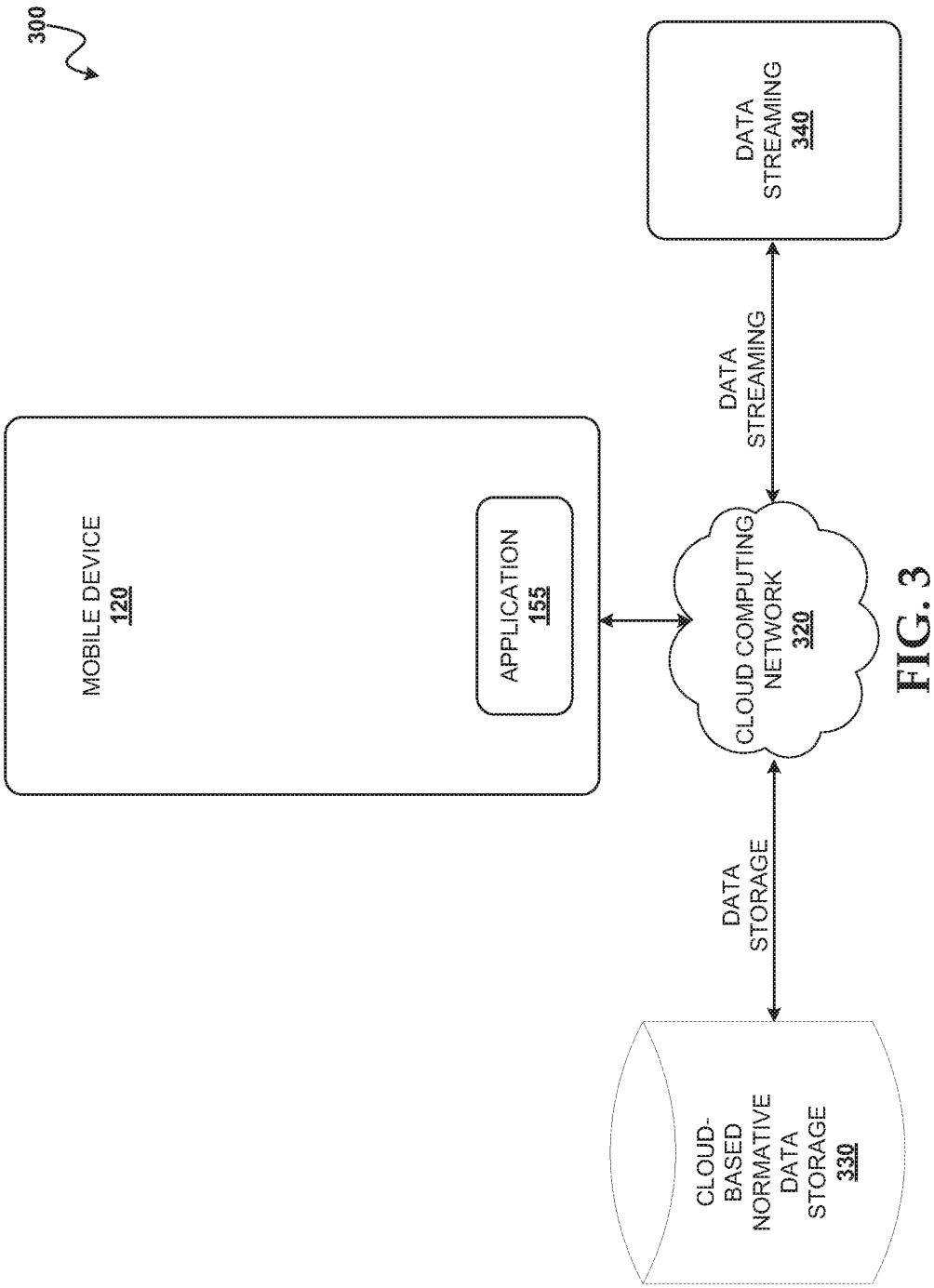
300
MOBILE DEVICE
120
APPLICATION
155
CLOUD COMPUTING NETWORK
320
DATA STREAMING
DATA STREAMING
340
DATA STORAGE
CLOUD-BASED NORMATIVE DATA STORAGE
330

FIG. 3

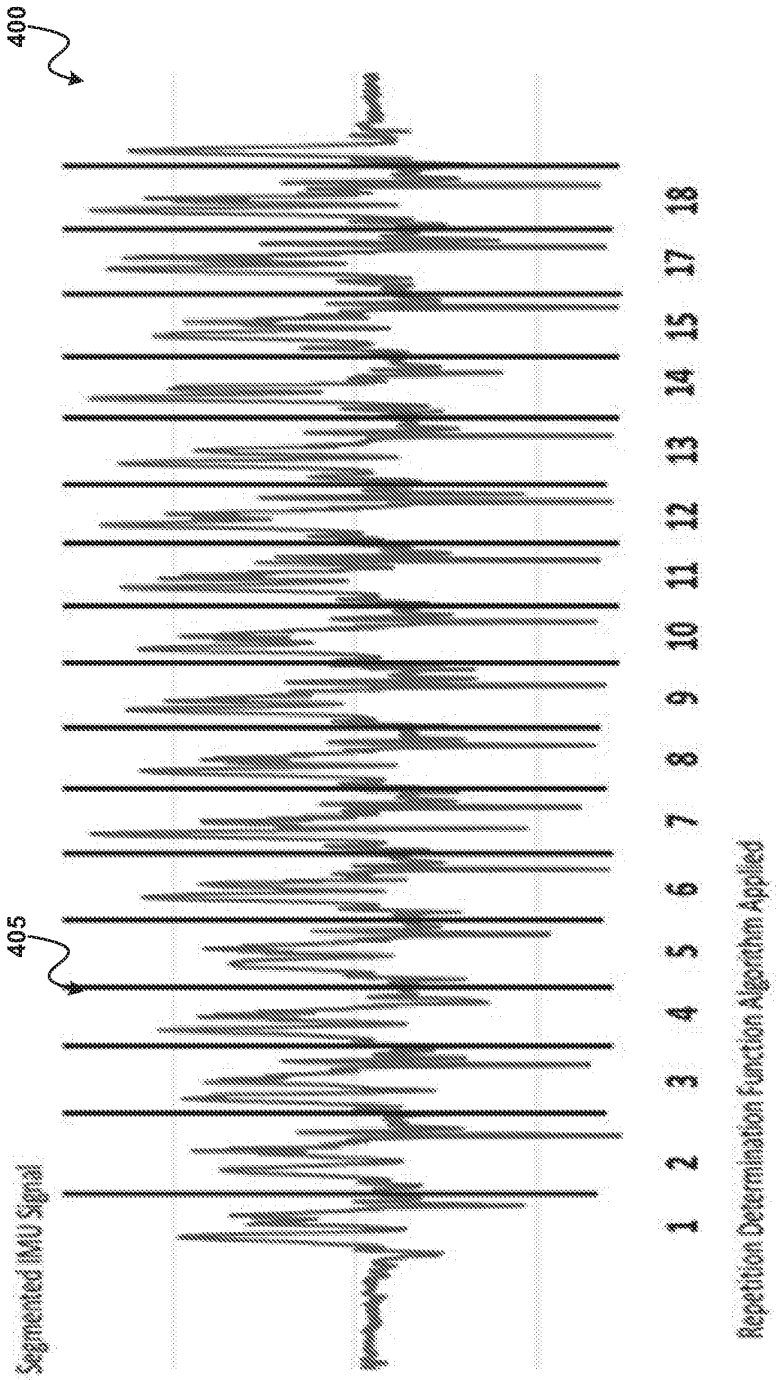
400
405
Segmented IMU Signal
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 17 18
Repetition Determination Function Algorithm Applied

FIG. 4A

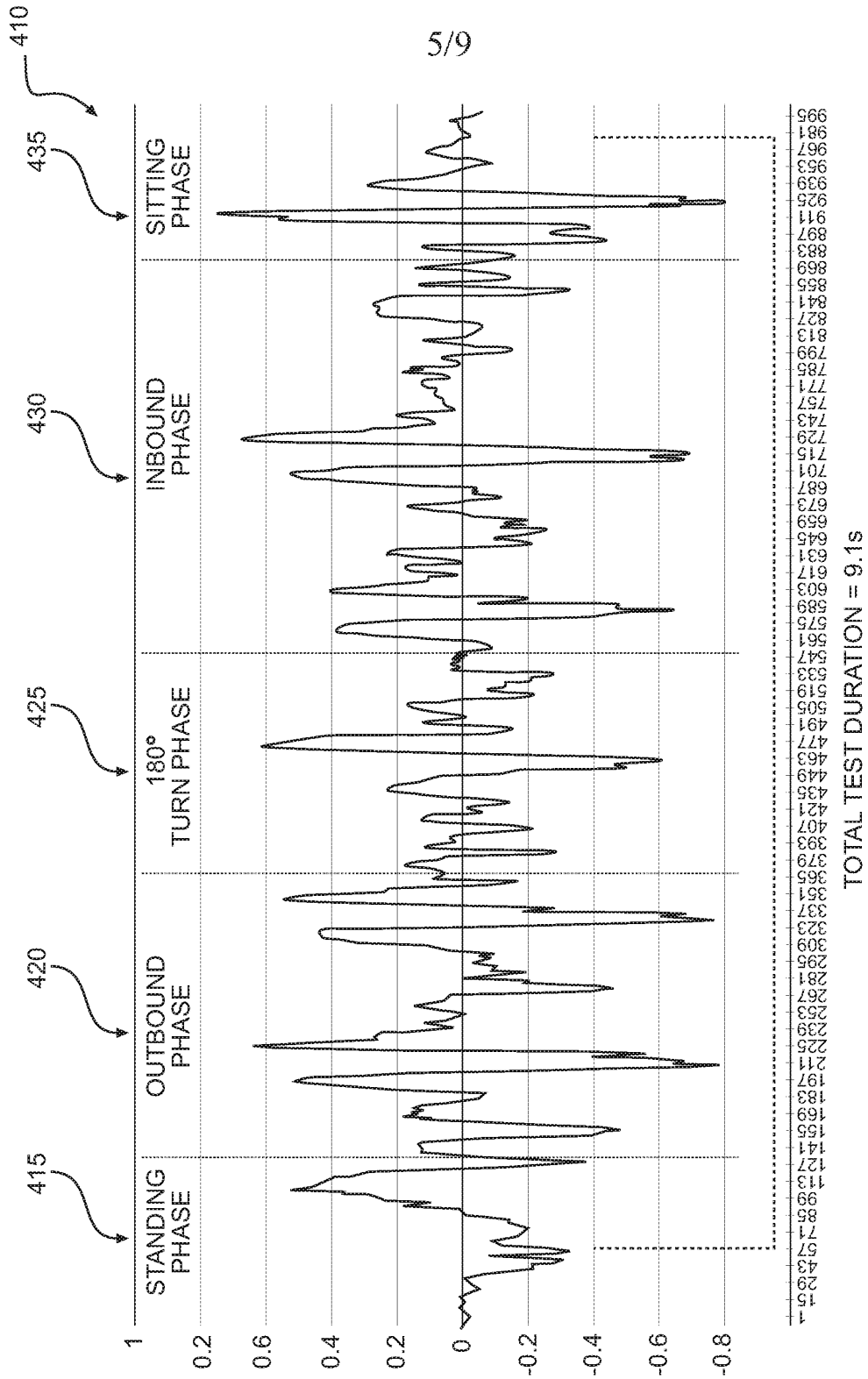
410
415
420
425
430
435
STANDING PHASE
OUTBOUND PHASE
180° TURN PHASE
INBOUND PHASE
SITTING PHASE
1
0.2
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
TOTAL TEST DURATION = 9.1s

FIG. 4B

500

Motion Task	Area of Assessment
Timed Up-and-Go	Static stability, dynamic stability, mobility and falls risk.
30 second Chair Stand	Lower body muscular strength, Lower body muscular endurance and falls risk.
Four Stage Balance Test	Static stability, postural stability, and falls risk.
Gait Analysis	Dynamic stability, mobility and falls risk.
Functional Reach Test	Balance, stability, limits of stability and falls risk
Sit and Reach Test	Lower body flexibility.
5 Chair Stand Test	Lower body muscular strength.
10 Chair Stand Test	Lower body muscular strength and muscular endurance.
Arm Curl Test	Upper extremity muscular strength and upper extremity muscular endurance.
Postural Stability	Static stability

FIG. 5A

510

Motion Task	Extracted Features
Timed Up-and-Go	Time to completion, rate to complete standing task, rate to complete sitting task, turn rate, anteroposterior sway, mediolateral sway, gait characteristics (see gait).
30 second Chair Stand	Total repetitions, time rate of repetition completion decay, anteroposterior sway, mediolateral sway.
Four Stage Balance Test	Anteroposterior sway, mediolateral sway, total magnitude of displacement, success/failure of stage completion.
Gait	Cadence, linear velocity, stride length, step length, stance and swing times.
Functional Reach Test	Resultant displacement, vertical displacement, mediolateral displacement.
Sit and Reach Test	Resultant displacement, vertical displacement, mediolateral displacement.
5 Chair Stand Test	Total repetitions, time rate of repetition completion decay, anteroposterior sway, mediolateral sway.
10 Chair Stand Test	Total repetitions, time rate of repetition completion decay, anteroposterior sway, mediolateral sway.
Arm Curl Test	Total repetitions, time rate of repetition completion decay, resultant displacement, mediolateral displacement.
Postural Stability	Anteroposterior sway, mediolateral sway, total magnitude of displacement.

FIG. 5B

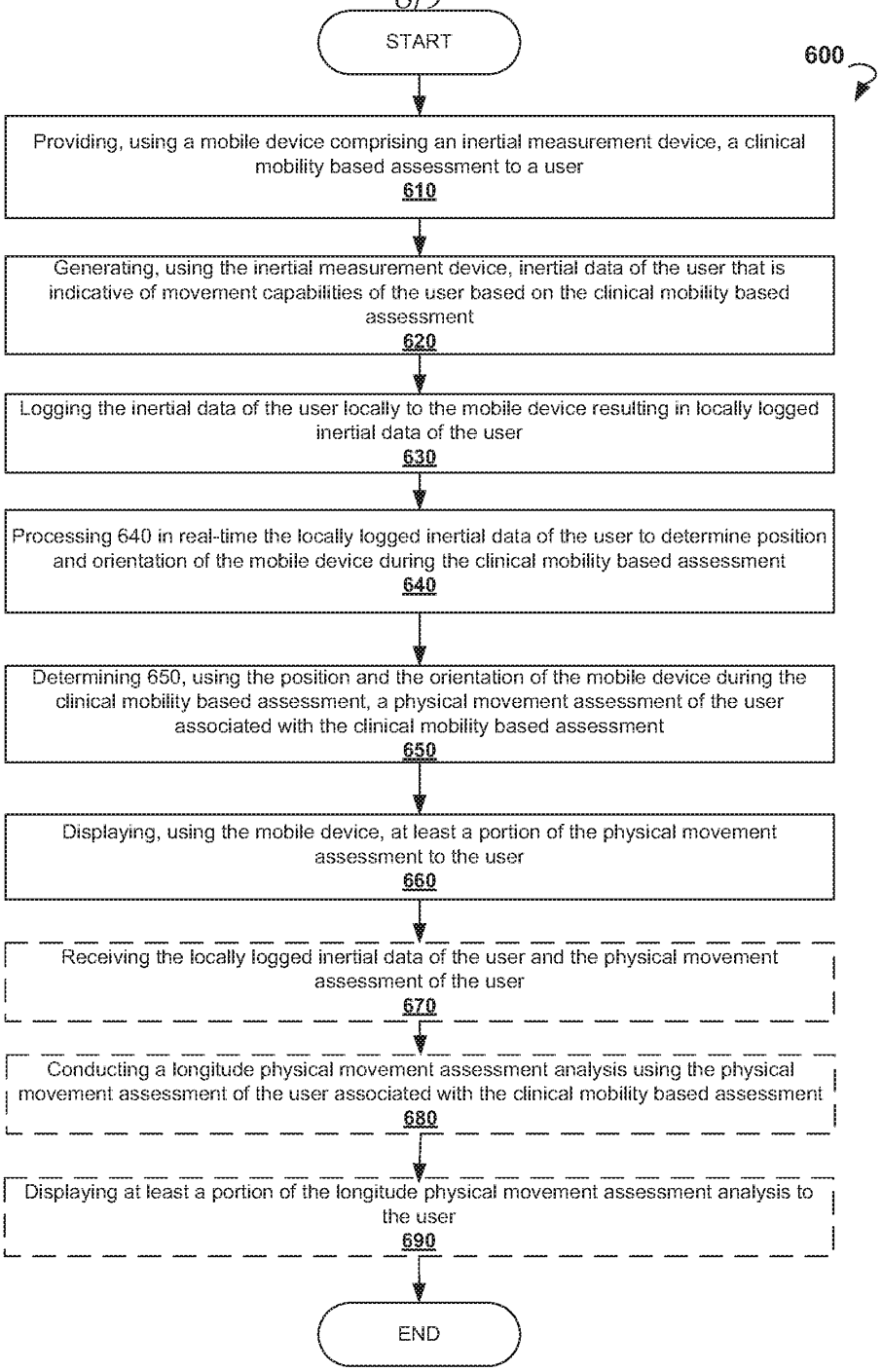
START
600
Providing, using a mobile device comprising an inertial measurement device, a clinical mobility based assessment to a user
610
Generating, using the inertial measurement device, inertial data of the user that is indicative of movement capabilities of the user based on the clinical mobility based assessment
620
Logging the inertial data of the user locally to the mobile device resulting in locally logged inertial data of the user
630
Processing 640 in real-time the locally logged inertial data of the user to determine position and orientation of the mobile device during the clinical mobility based assessment
640
Determining 650, using the position and the orientation of the mobile device during the clinical mobility based assessment, a physical movement assessment of the user associated with the clinical mobility based assessment
650
Displaying, using the mobile device, at least a portion of the physical movement assessment to the user
660
Receiving the locally logged inertial data of the user and the physical movement assessment of the user
670
Conducting a longitude physical movement assessment analysis using the physical movement assessment of the user associated with the clinical mobility based assessment
680
Displaying at least a portion of the longitude physical movement assessment analysis to the user
690
END

FIG. 6

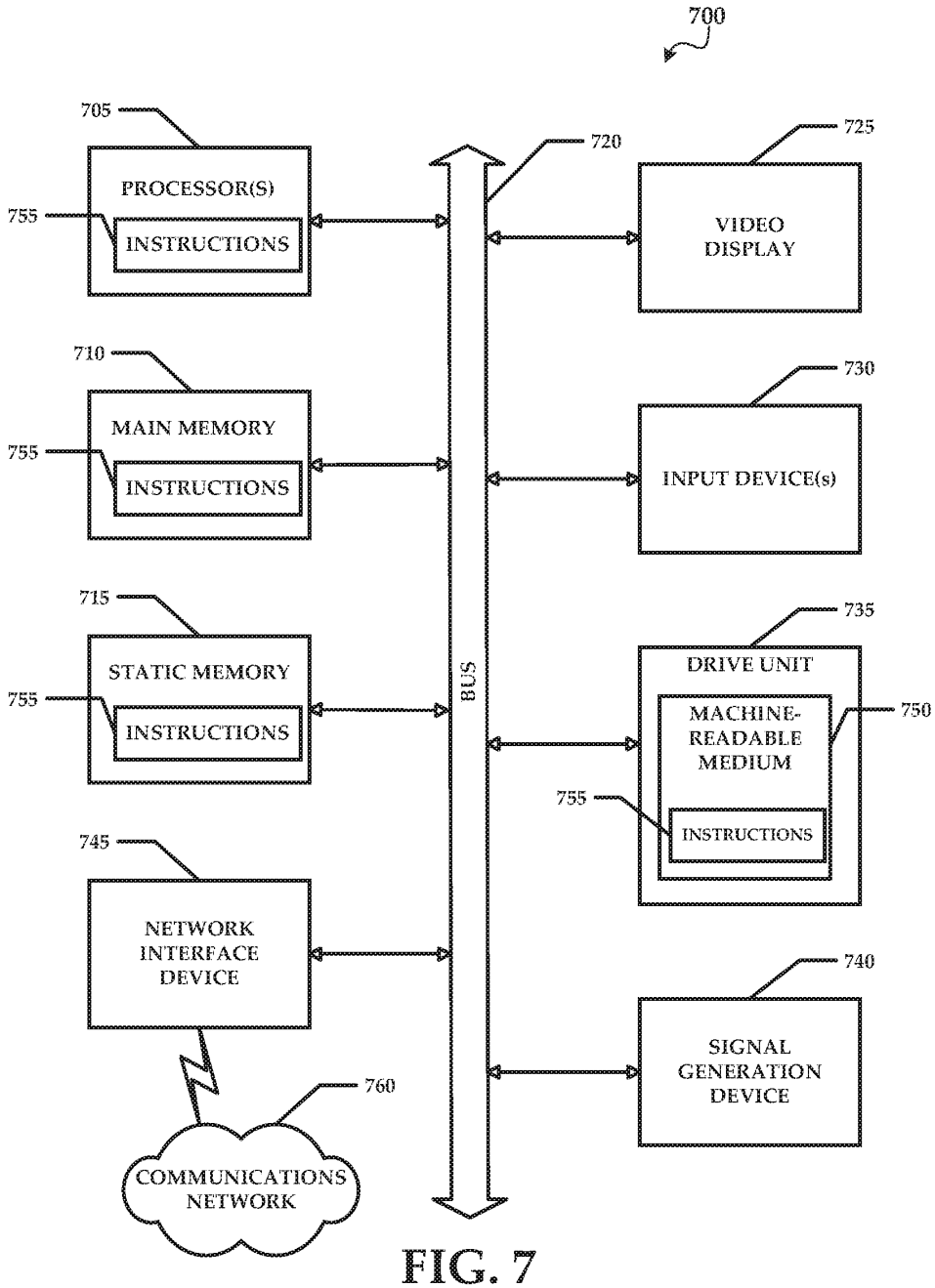
700
705
PROCESSOR(S)
755
INSTRUCTIONS
710
MAIN MEMORY
755
INSTRUCTIONS
715
STATIC MEMORY
755
INSTRUCTIONS
745
NETWORK INTERFACE DEVICE
760
COMMUNICATIONS NETWORK
720
BUS
725
VIDEO DISPLAY
730
INPUT DEVICE(s)
735
DRIVE UNIT
MACHINE-READABLE MEDIUM
750
755
INSTRUCTIONS
740
SIGNAL GENERATION DEVICE

FIG. 7