100

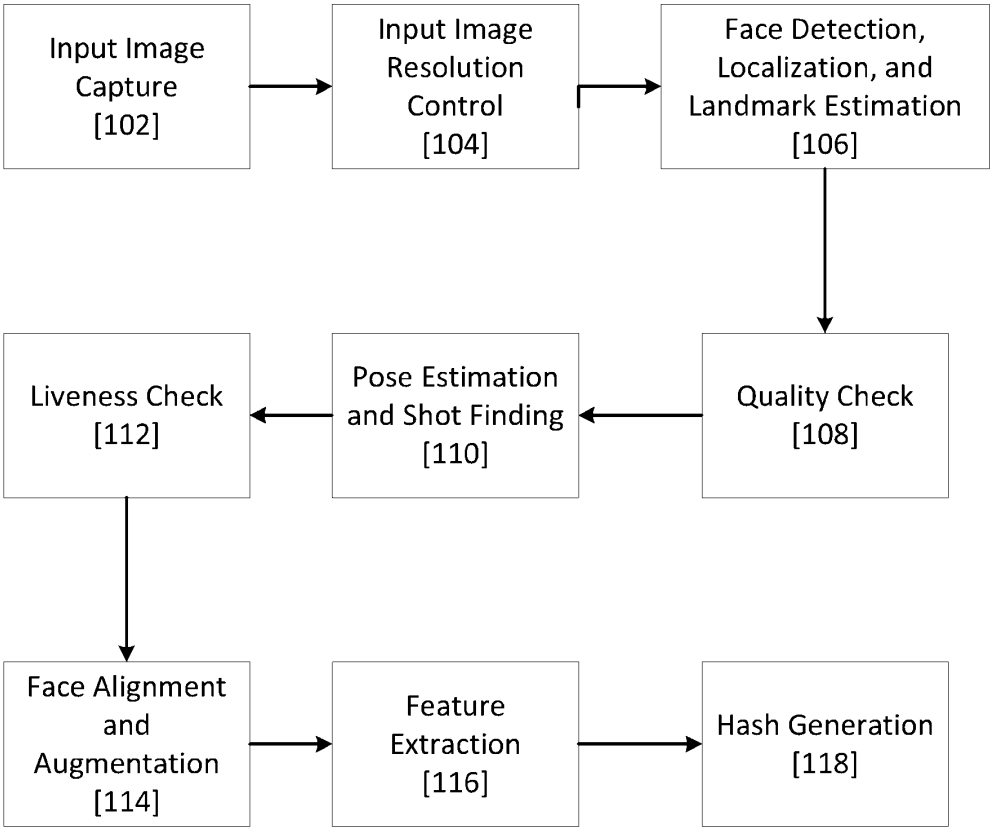
Input Image Capture [102]
Input Image Resolution Control [104]
Face Detection, Localization, and Landmark Estimation [106]
Quality Check [108]
Pose Estimation and Shot Finding [110]
Liveness Check [112]
Face Alignment and Augmentation [114]
Feature Extraction [116]
Hash Generation [118]

FIG. 1

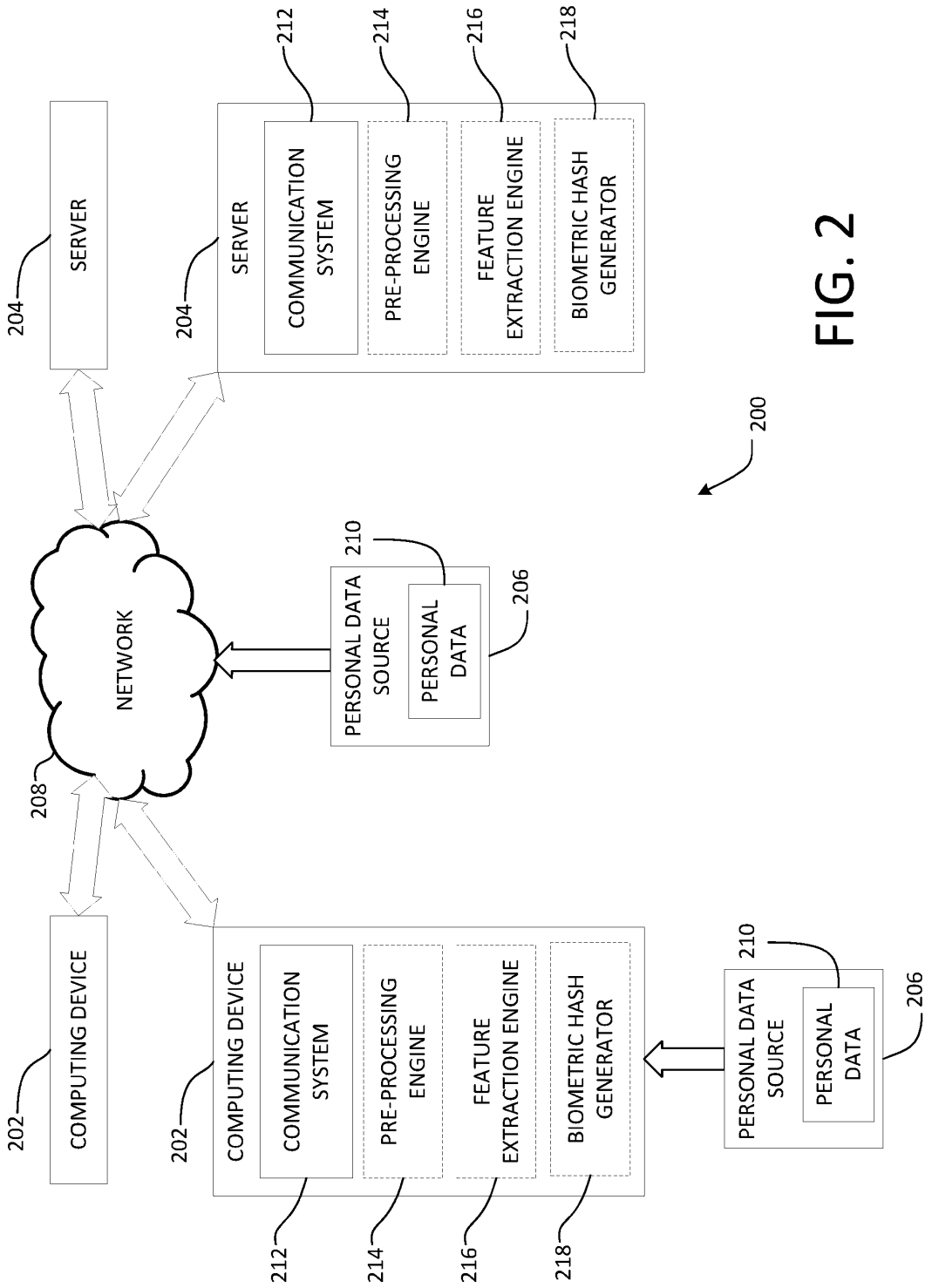
200
202
COMPUTING DEVICE
COMPUTING DEVICE
COMMUNICATION SYSTEM
PRE-PROCESSING ENGINE
FEATURE EXTRACTION ENGINE
BIOMETRIC HASH GENERATOR
212
214
216
218
204
SERVER
SERVER
COMMUNICATION SYSTEM
PRE-PROCESSING ENGINE
FEATURE EXTRACTION ENGINE
BIOMETRIC HASH GENERATOR
208
NETWORK
210
PERSONAL DATA SOURCE
PERSONAL DATA
206
PERSONAL DATA SOURCE
PERSONAL DATA

FIG. 2

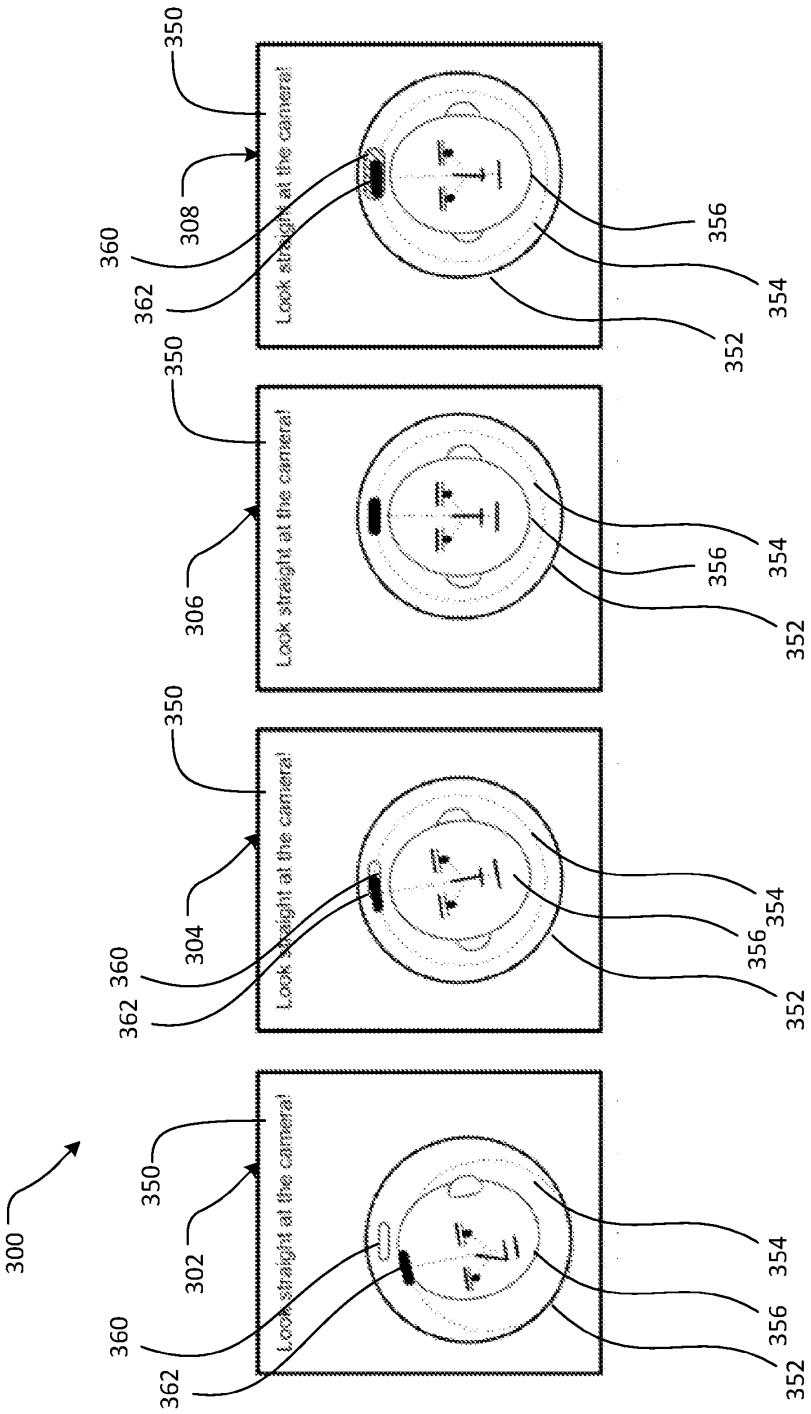
300
302
304
306
308
350
352
354
356
360
362
Look straight at the camera!

FIG. 3A

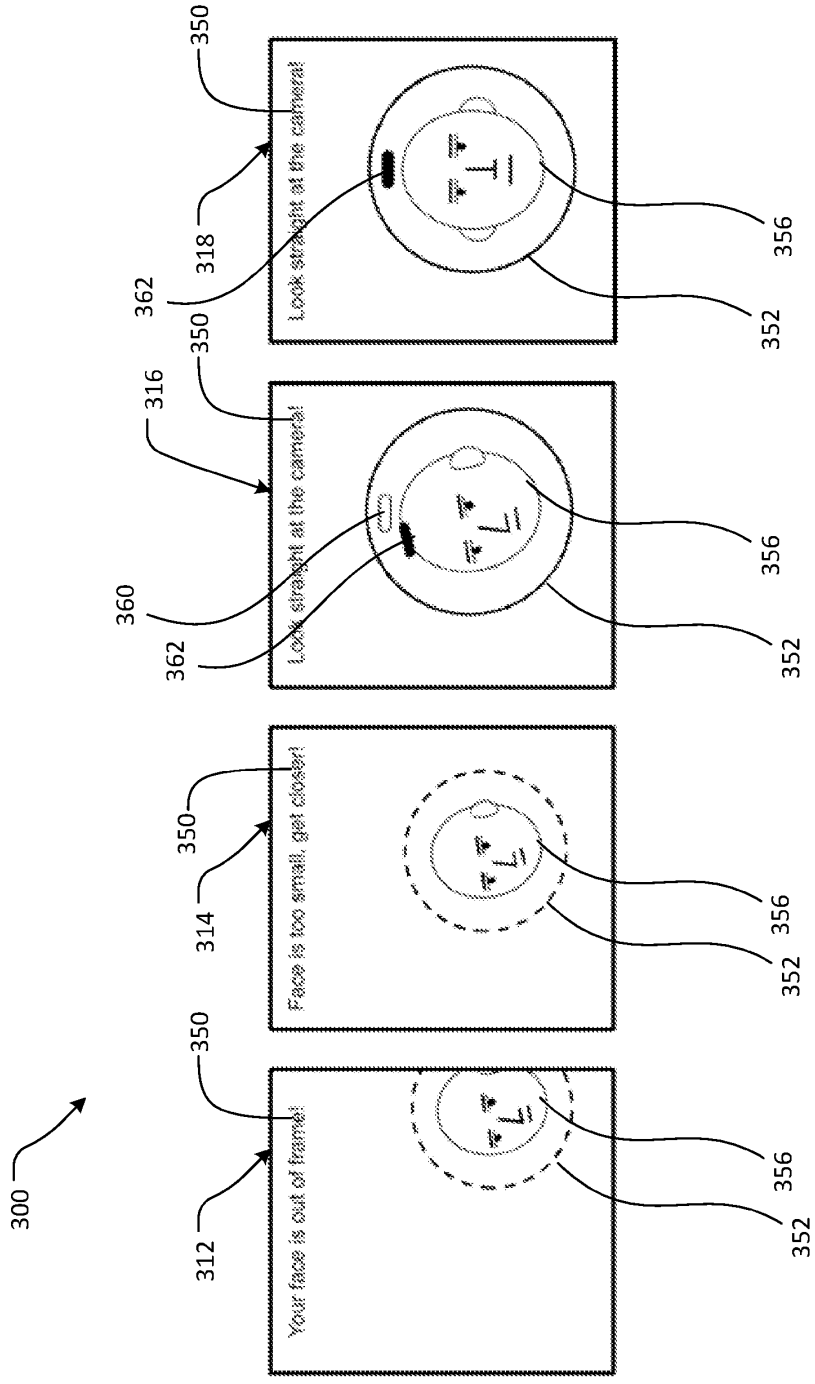
300
312
350
Your face is out of frame!
314
350
Face is too small, get closer!
316
350
Look straight at the camera!
318
350
Look straight at the camera!
352
356
360
362

FIG. 3B

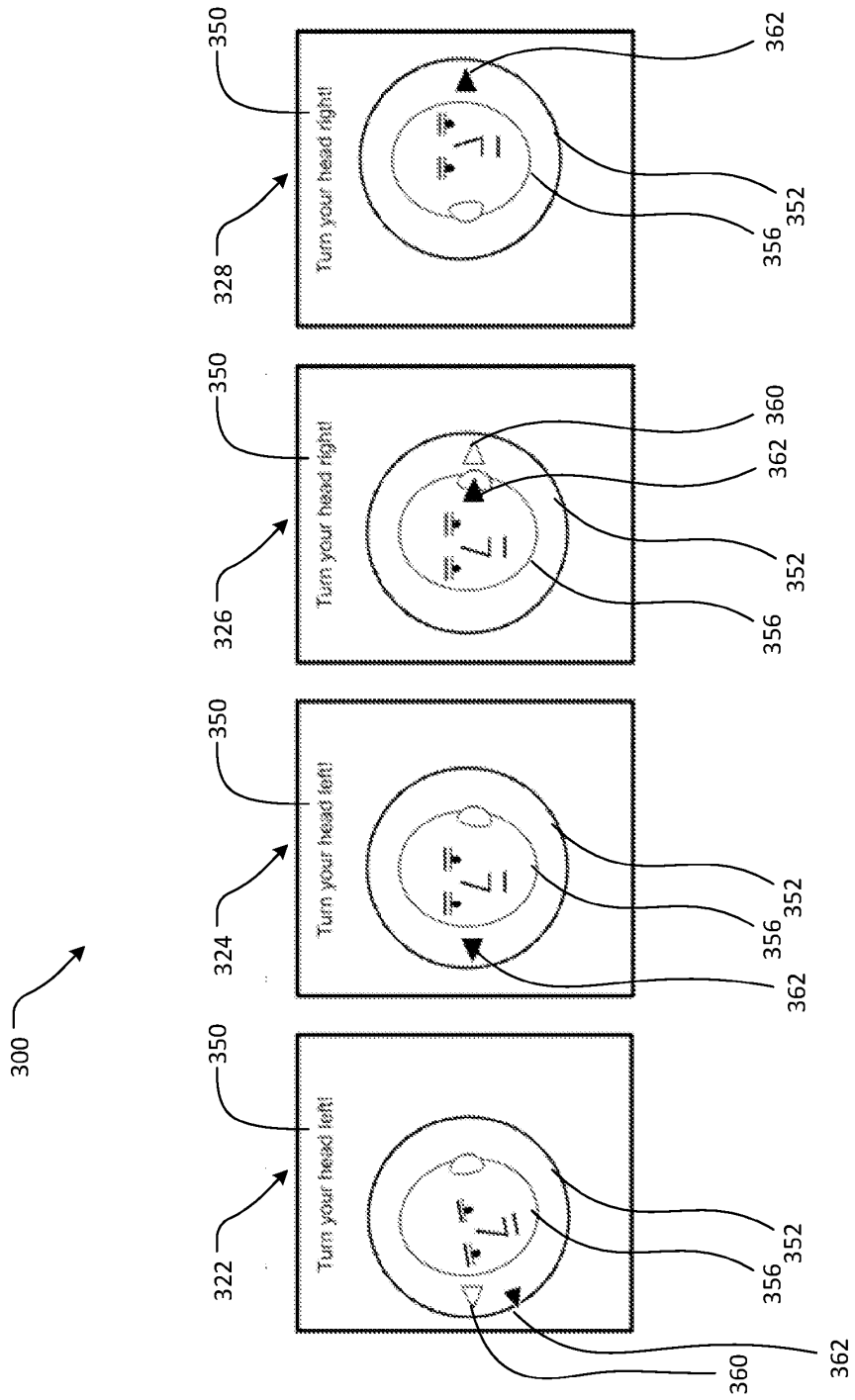
300
322
324
326
328
350
Turn your head left!
Turn your head right!
352
356
360
362

FIG. 3C

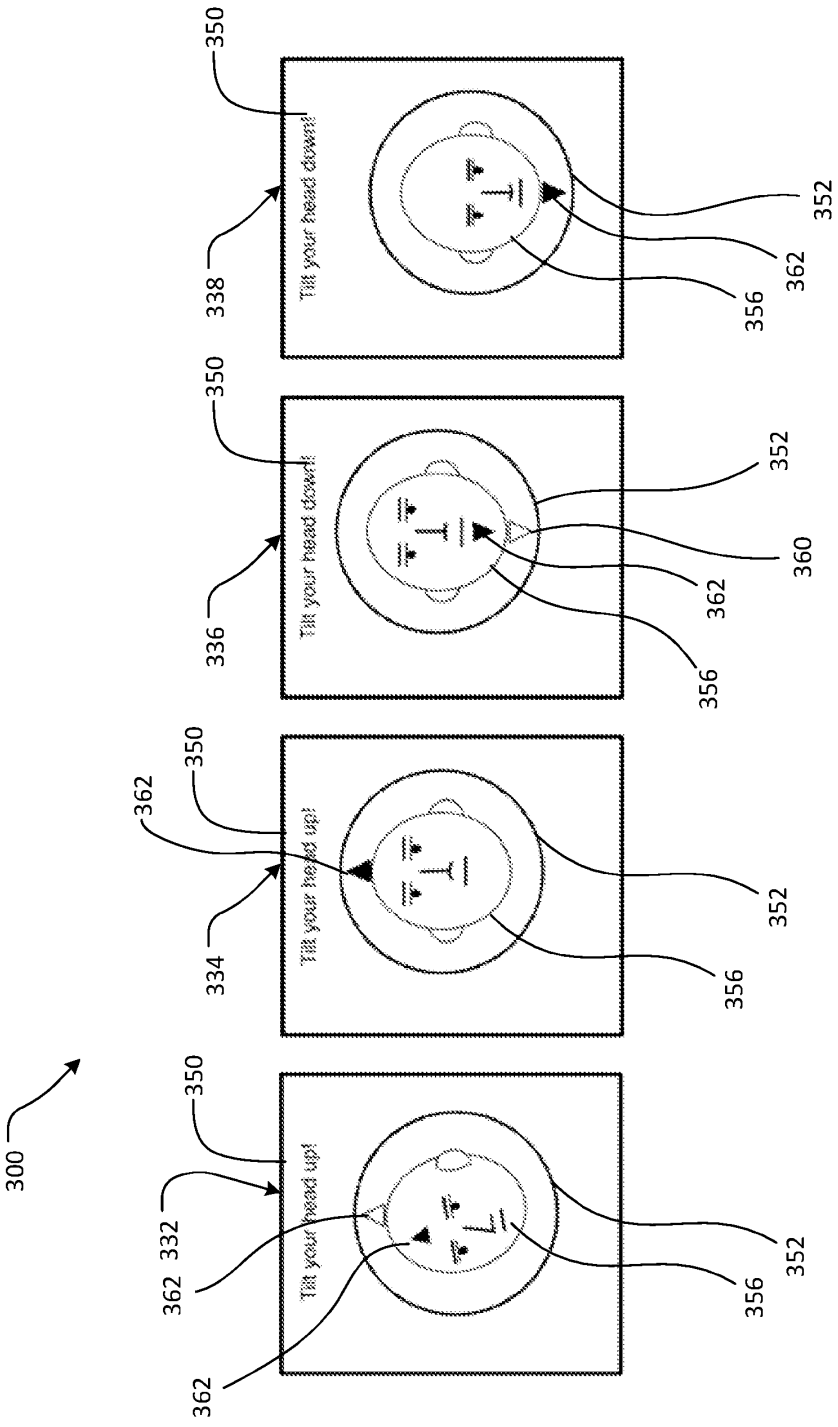
300
350
Tilt your head up!
362
332
362
352
356
350
Tilt your head up!
334
362
352
356
350
Tilt your head down!
336
352
360
362
356
350
Tilt your head down!
338
352
362
356

FIG. 3D

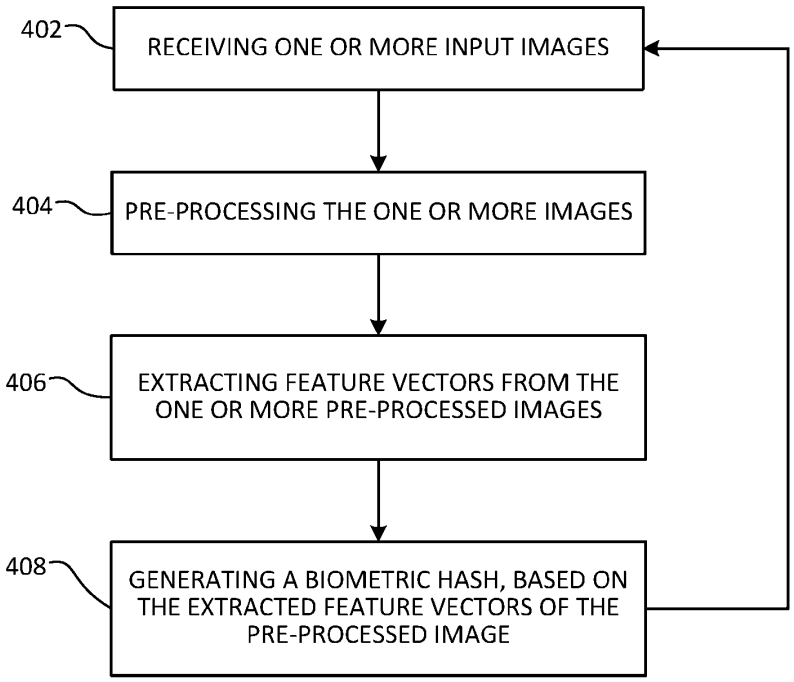
402
RECEIVING ONE OR MORE INPUT IMAGES
404
PRE-PROCESSING THE ONE OR MORE IMAGES
406
EXTRACTING FEATURE VECTORS FROM THE ONE OR MORE PRE-PROCESSED IMAGES
408
GENERATING A BIOMETRIC HASH, BASED ON THE EXTRACTED FEATURE VECTORS OF THE PRE-PROCESSED IMAGE
400

FIG. 4

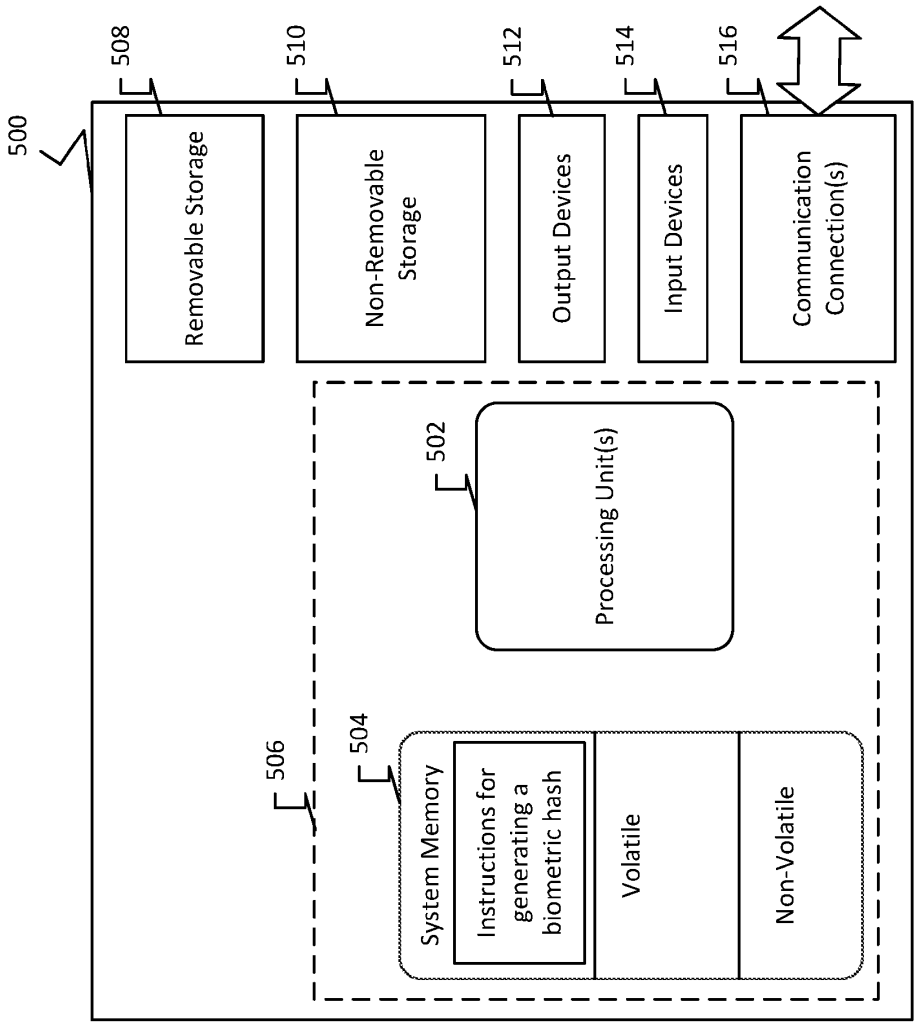
500
508
510
512
514
516
Removable Storage
Non-Removable Storage
Output Devices
Input Devices
Communication Connection(s)
502
Processing Unit(s)
506
504
System Memory
Instructions for generating a biometric hash
Volatile
Non-Volatile

FIG. 5