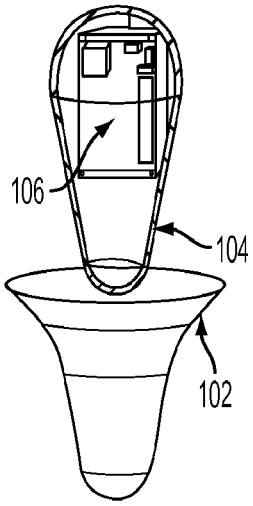
106
104
102

FIG. 1

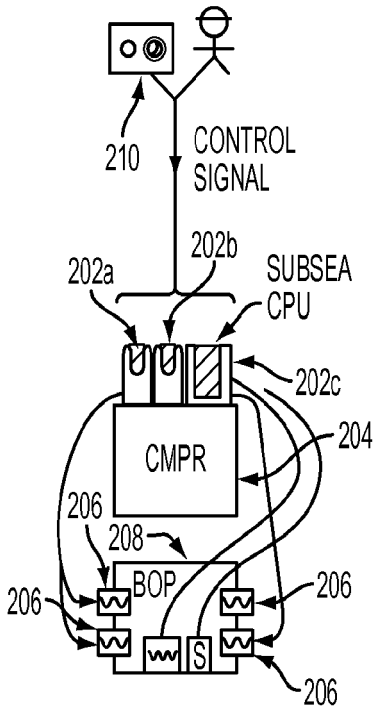
210
CONTROL SIGNAL
202b
202a
SUBSEA CPU
202c
204
CMPR
206
208
BOP
206
206
S
206

FIG. 2

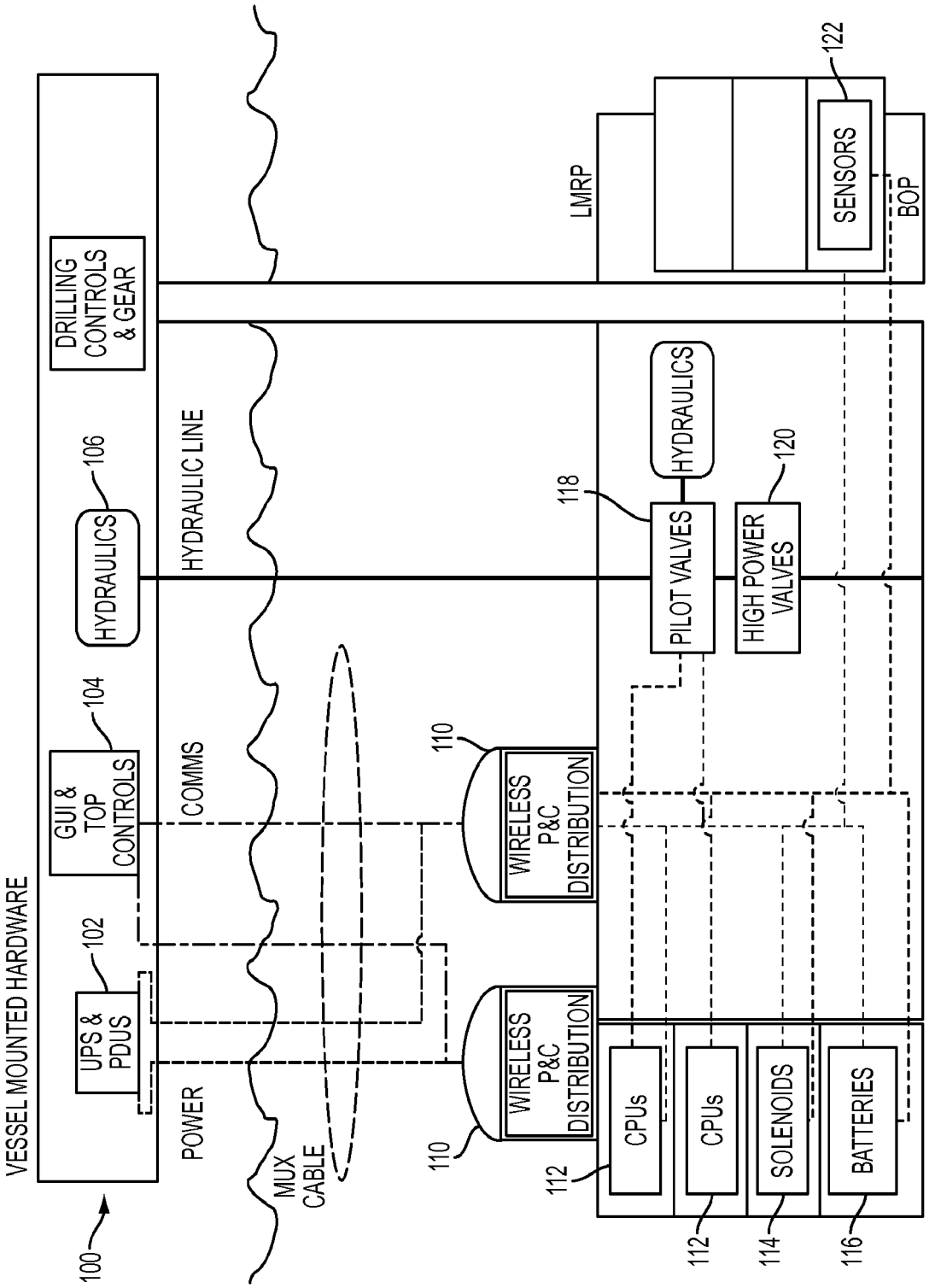
VESSEL MOUNTED HARDWARE
100
DRILLING CONTROLS & GEAR
HYDRAULICS
106
GUI & TOP CONTROLS
104
UPS & PDUS
102
HYDRAULIC LINE
COMMS
POWER
MUX CABLE
110
WIRELESS P&C DISTRIBUTION
110
WIRELESS P&C DISTRIBUTION
112
CPUs
CPUs
112
SOLENOIDS
114
BATTERIES
116
LMRP
118
HYDRAULICS
PILOT VALVES
HIGH POWER VALVES
120
SENSORS
122
BOP

FIG. 3

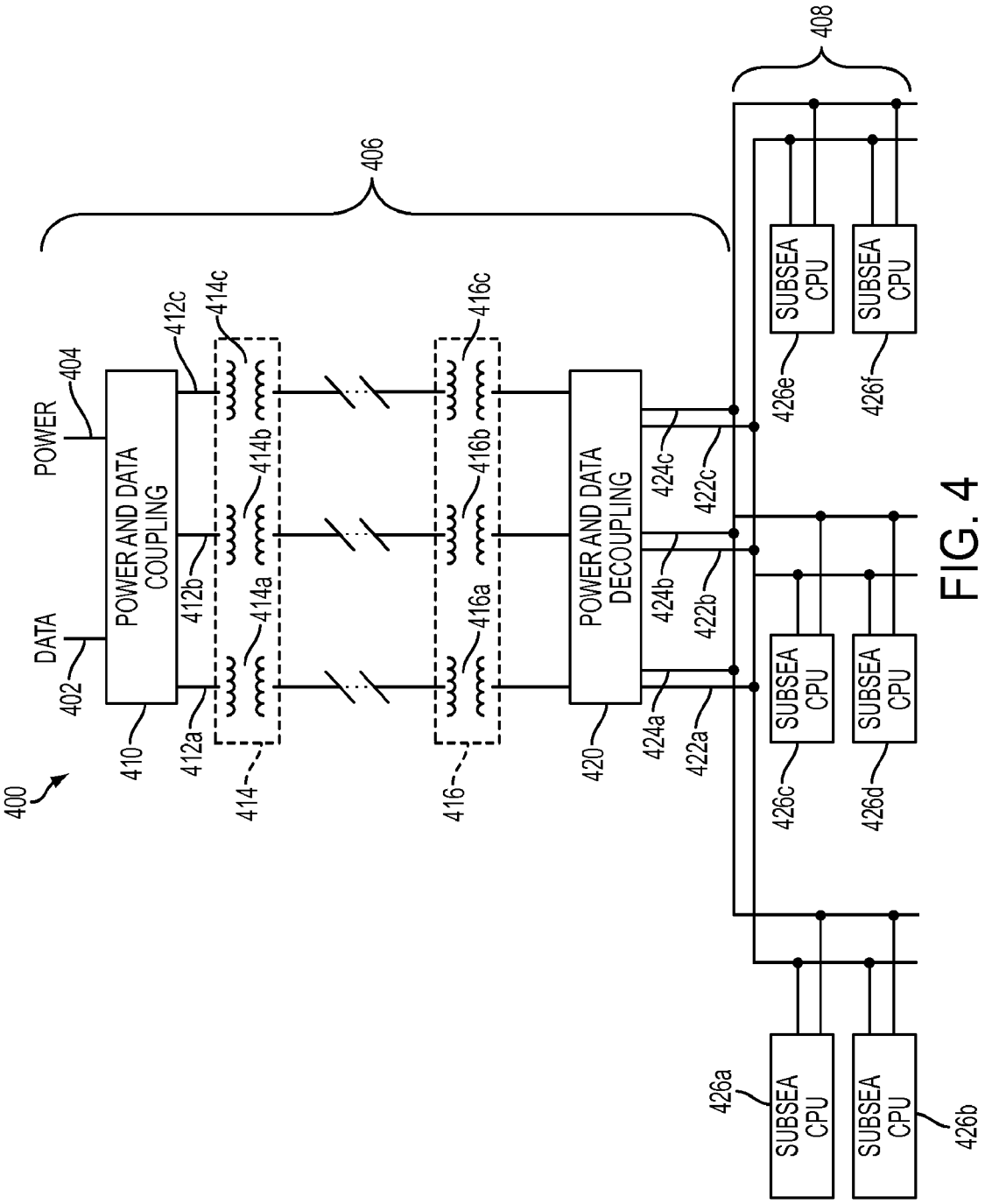
400
POWER
DATA
402
404
POWER AND DATA COUPLING
410
412a
412b
412c
414
414a
414b
414c
406
416
416a
416b
416c
POWER AND DATA DECOUPLING
420
422a
422b
422c
424a
424b
424c
408
SUBSEA CPU
426a
426b
426c
426d
426e
426f

FIG. 4

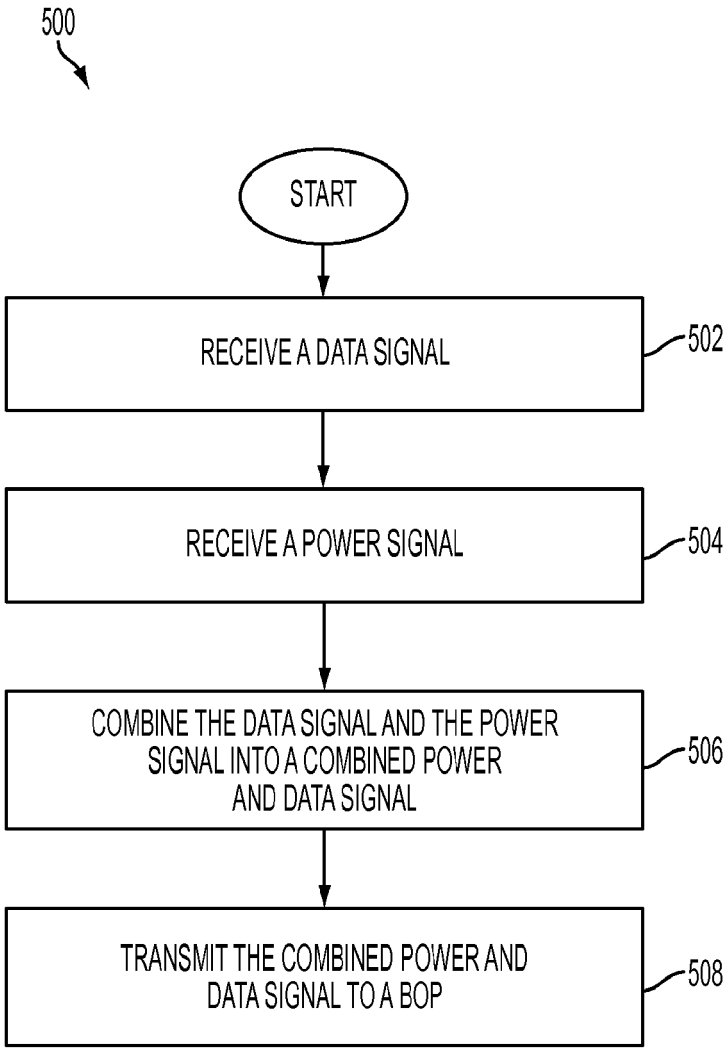
500
START
RECEIVE A DATA SIGNAL
502
RECEIVE A POWER SIGNAL
504
COMBINE THE DATA SIGNAL AND THE POWER SIGNAL INTO A COMBINED POWER AND DATA SIGNAL
506
TRANSMIT THE COMBINED POWER AND DATA SIGNAL TO A BOP
508

FIG. 5

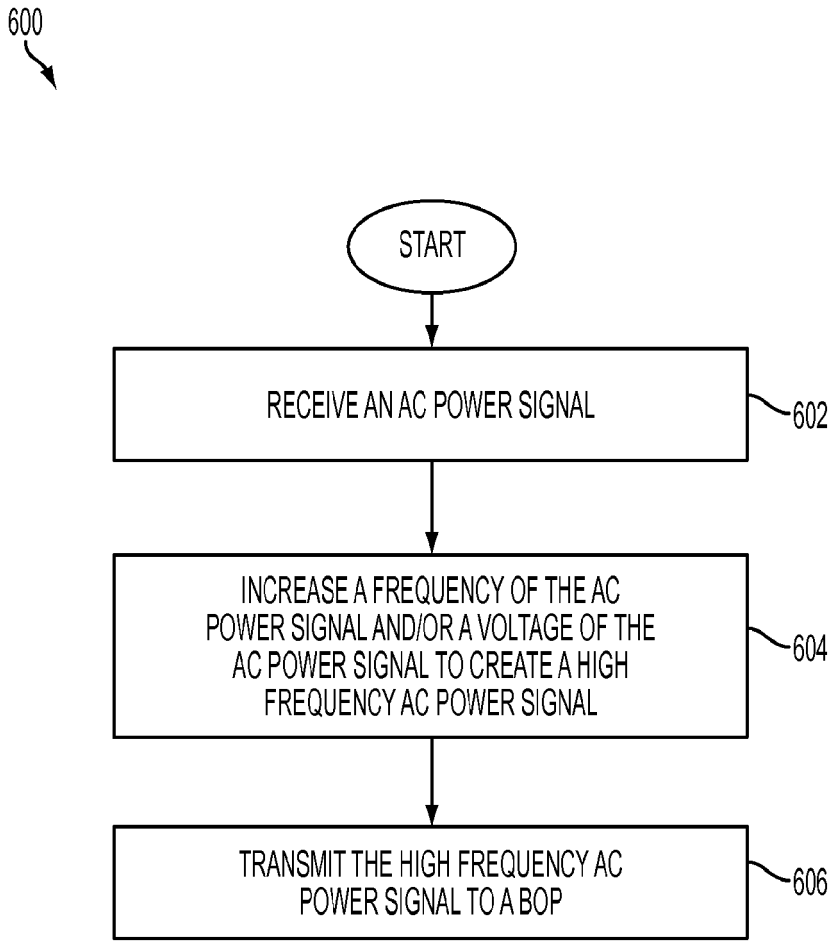
600
START
RECEIVE AN AC POWER SIGNAL
602
INCREASE A FREQUENCY OF THE AC POWER SIGNAL AND/OR A VOLTAGE OF THE AC POWER SIGNAL TO CREATE A HIGH FREQUENCY AC POWER SIGNAL
604
TRANSMIT THE HIGH FREQUENCY AC POWER SIGNAL TO A BOP
606

FIG. 6

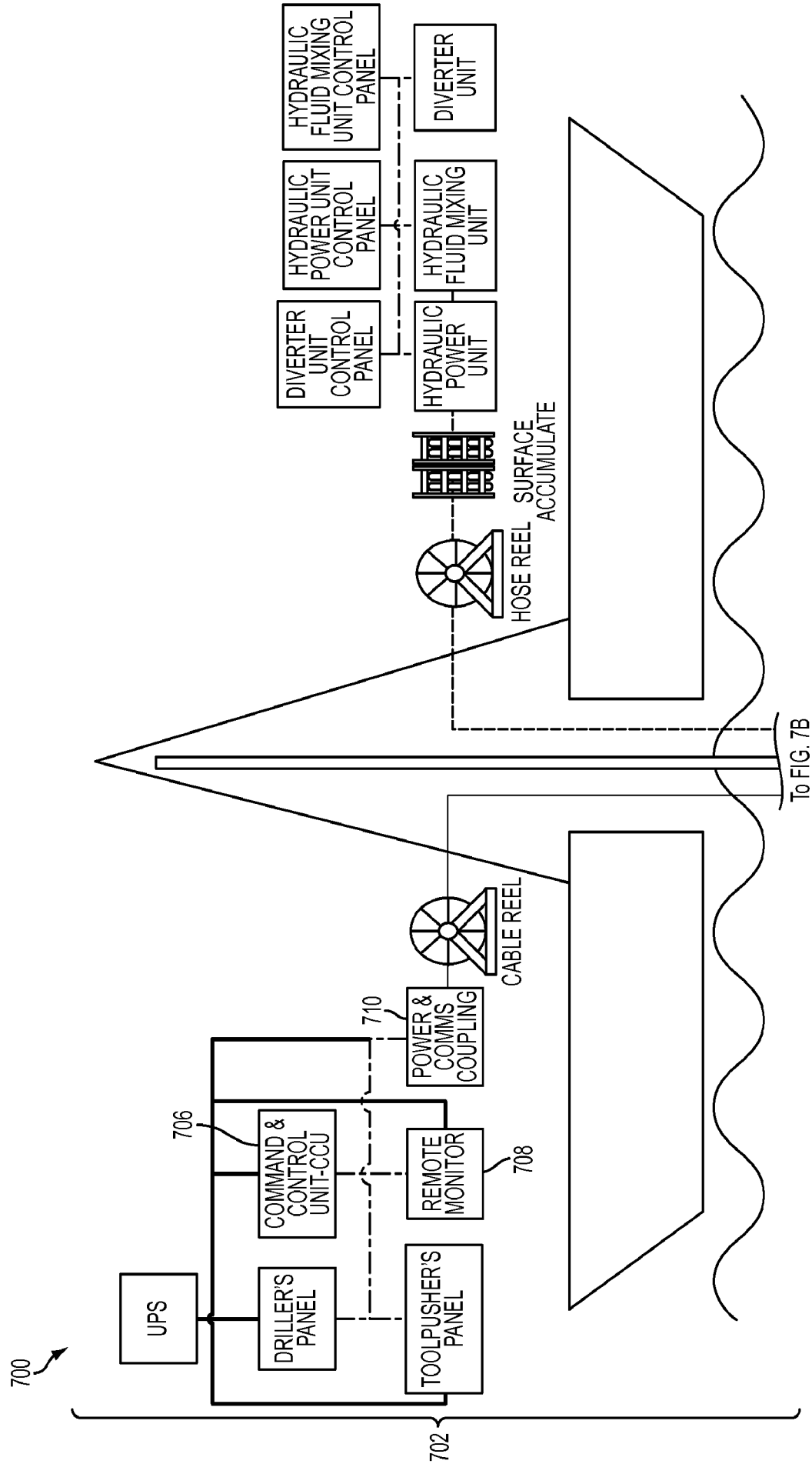
700
UPS
DRILLER'S PANEL
COMMAND & CONTROL UNIT-CCU
TOOLPUSHER'S PANEL
REMOTE MONITOR
POWER & COMMS COUPLING
706
708
710
CABLE REEL
HOSE REEL
SURFACE ACCUMULATE
HYDRAULIC POWER UNIT
DIVERTER UNIT CONTROL PANEL
HYDRAULIC POWER UNIT CONTROL PANEL
HYDRAULIC FLUID MIXING UNIT CONTROL PANEL
HYDRAULIC FLUID MIXING UNIT
DIVERTER UNIT
To FIG. 7B
702

FIG. 7A

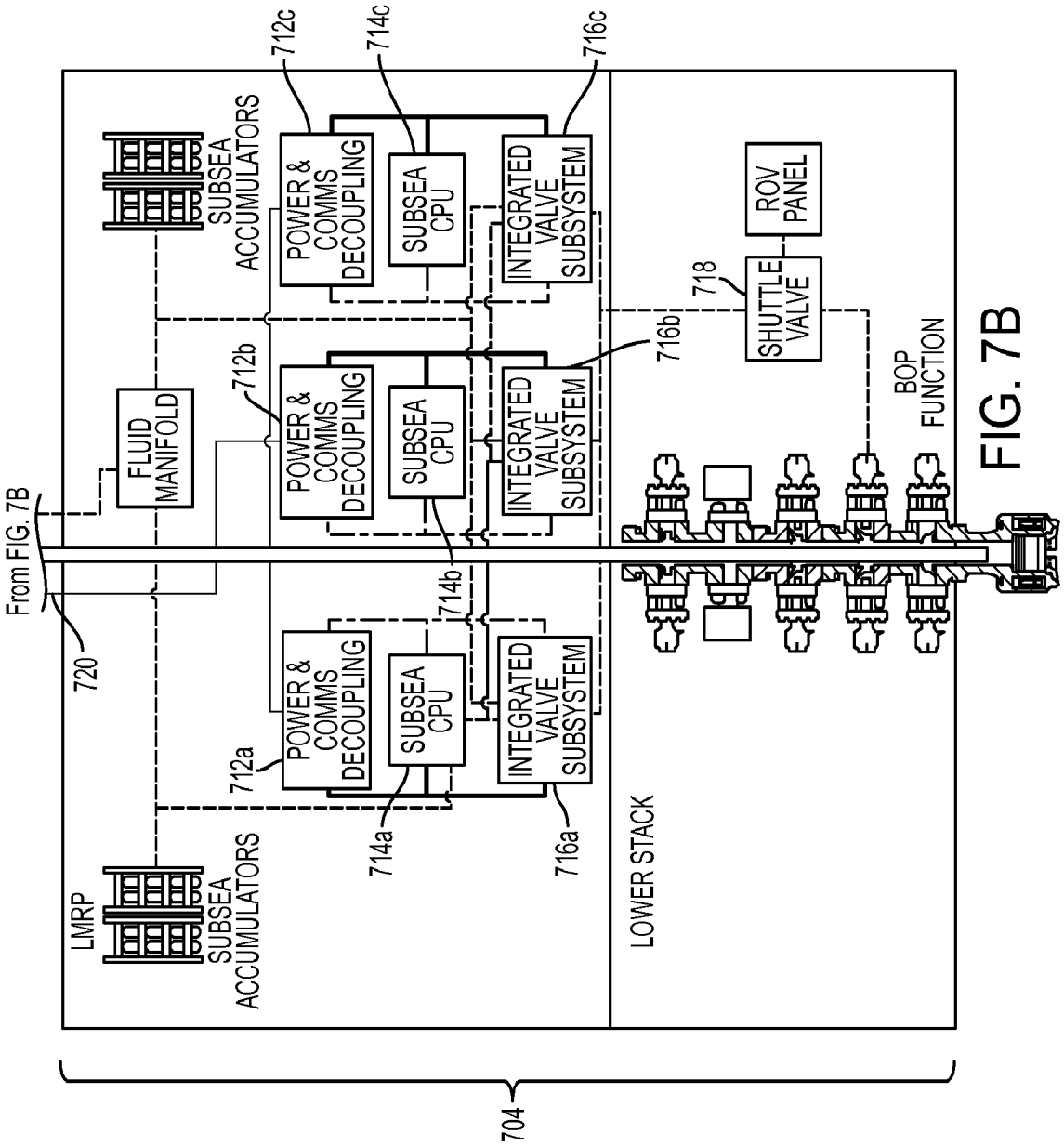
From FIG. 7B
720
FLUID MANIFOLD
LMRP
SUBSEA ACCUMULATORS
712a
712b
712c
POWER & COMMS DECOUPLING
SUBSEA CPU
714a
714b
714c
INTEGRATED VALVE SUBSYSTEM
716a
716b
716c
718
SHUTTLE VALVE
ROV PANEL
BOP FUNCTION
LOWER STACK
704

FIG. 7B

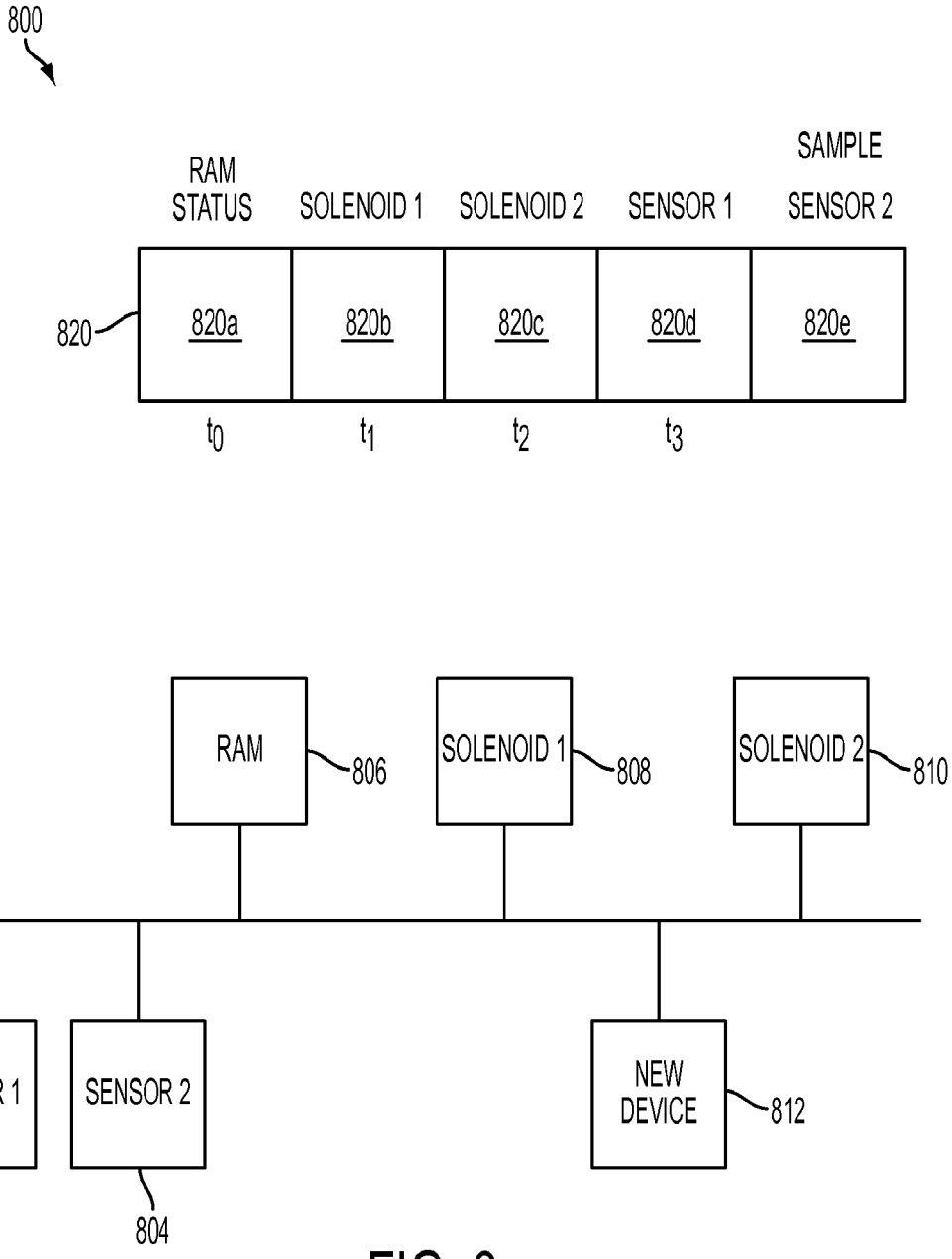
800
RAM STATUS
SOLENOID 1
SOLENOID 2
SENSOR 1
SAMPLE SENSOR 2
820
820a
820b
820c
820d
820e
t_0
t_1
t_2
t_3
RAM
806
SOLENOID 1
808
SOLENOID 2
810
SENSOR 1
SENSOR 2
NEW DEVICE
812
802
804

FIG. 8

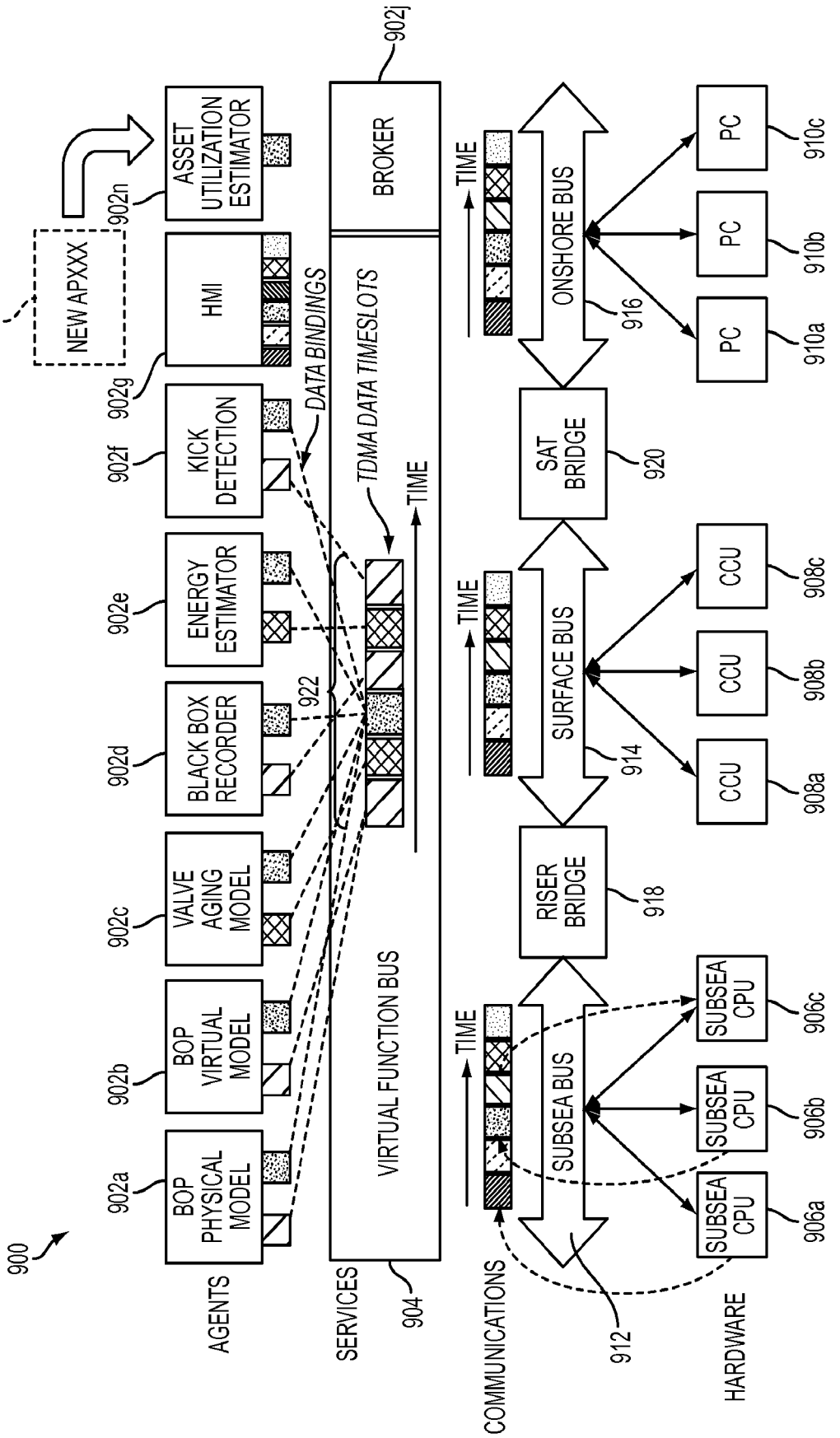
900
AGENTS
SERVICES
COMMUNICATIONS
HARDWARE
902a
BOP PHYSICAL MODEL
902b
BOP VIRTUAL MODEL
902c
VALVE AGING MODEL
902d
BLACK BOX RECORDER
902e
ENERGY ESTIMATOR
902f
KICK DETECTION
902g
HMI
902h
NEW APXXX
902n
ASSET UTILIZATION ESTIMATOR
902j
BROKER
904
VIRTUAL FUNCTION BUS
DATA BINDINGS
TDMA DATA TIMESLOTS
TIME
922
912
SUBSEA BUS
SUBSEA CPU
906a
SUBSEA CPU
906b
SUBSEA CPU
906c
RISER BRIDGE
918
SURFACE BUS
914
CCU
908a
CCU
908b
CCU
908c
SAT BRIDGE
920
ONSHORE BUS
916
PC
910a
PC
910b
PC
910c

FIG. 9

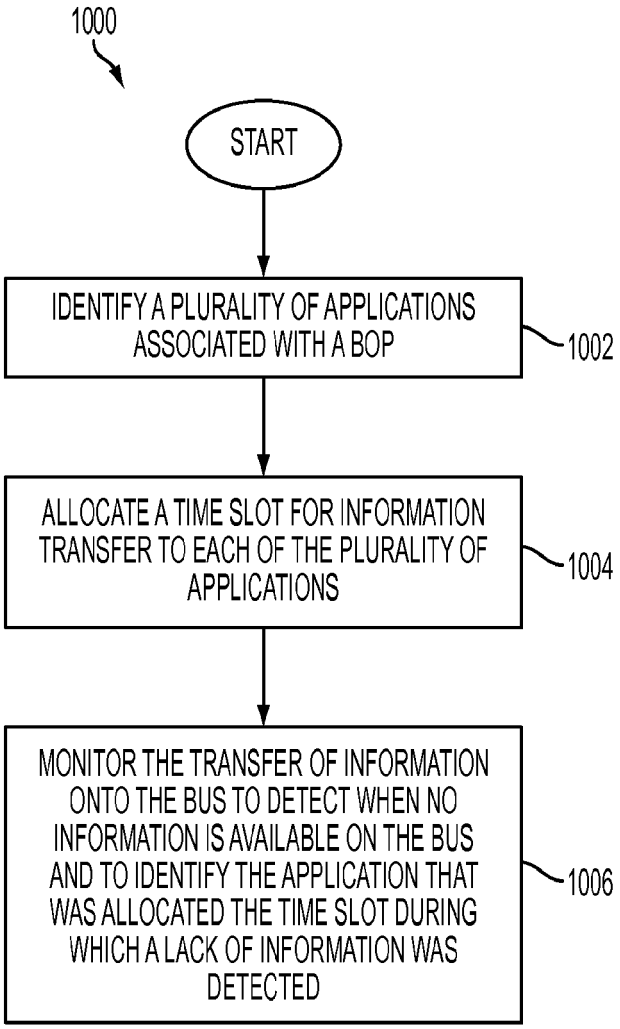
1000
START
IDENTIFY A PLURALITY OF APPLICATIONS ASSOCIATED WITH A BOP
1002
ALLOCATE A TIME SLOT FOR INFORMATION TRANSFER TO EACH OF THE PLURALITY OF APPLICATIONS
1004
MONITOR THE TRANSFER OF INFORMATION ONTO THE BUS TO DETECT WHEN NO INFORMATION IS AVAILABLE ON THE BUS AND TO IDENTIFY THE APPLICATION THAT WAS ALLOCATED THE TIME SLOT DURING WHICH A LACK OF INFORMATION WAS DETECTED
1006

FIG. 10

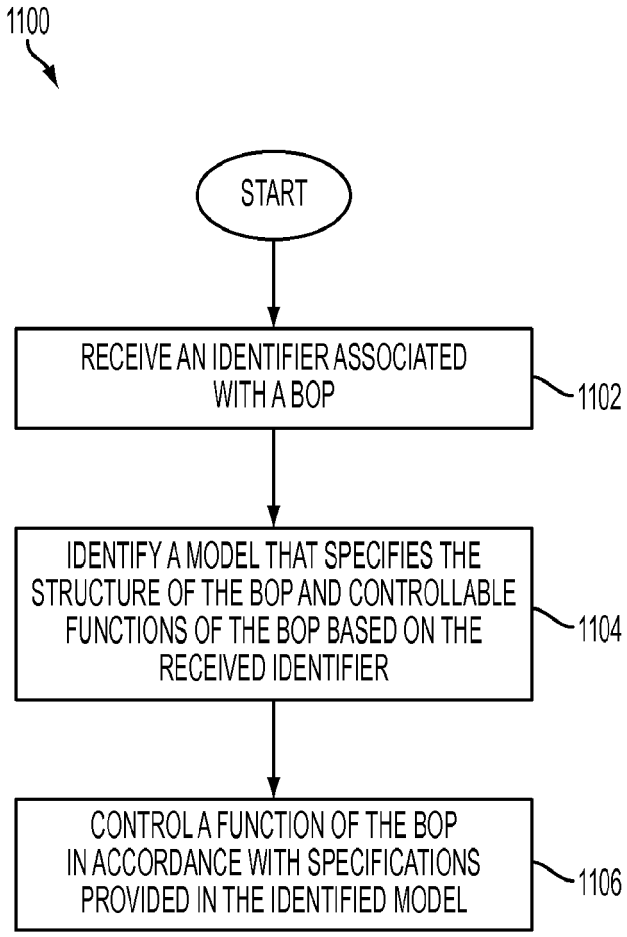
1100
START
RECEIVE AN IDENTIFIER ASSOCIATED WITH A BOP
1102
IDENTIFY A MODEL THAT SPECIFIES THE STRUCTURE OF THE BOP AND CONTROLLABLE FUNCTIONS OF THE BOP BASED ON THE RECEIVED IDENTIFIER
1104
CONTROL A FUNCTION OF THE BOP IN ACCORDANCE WITH SPECIFICATIONS PROVIDED IN THE IDENTIFIED MODEL
1106

FIG. 11