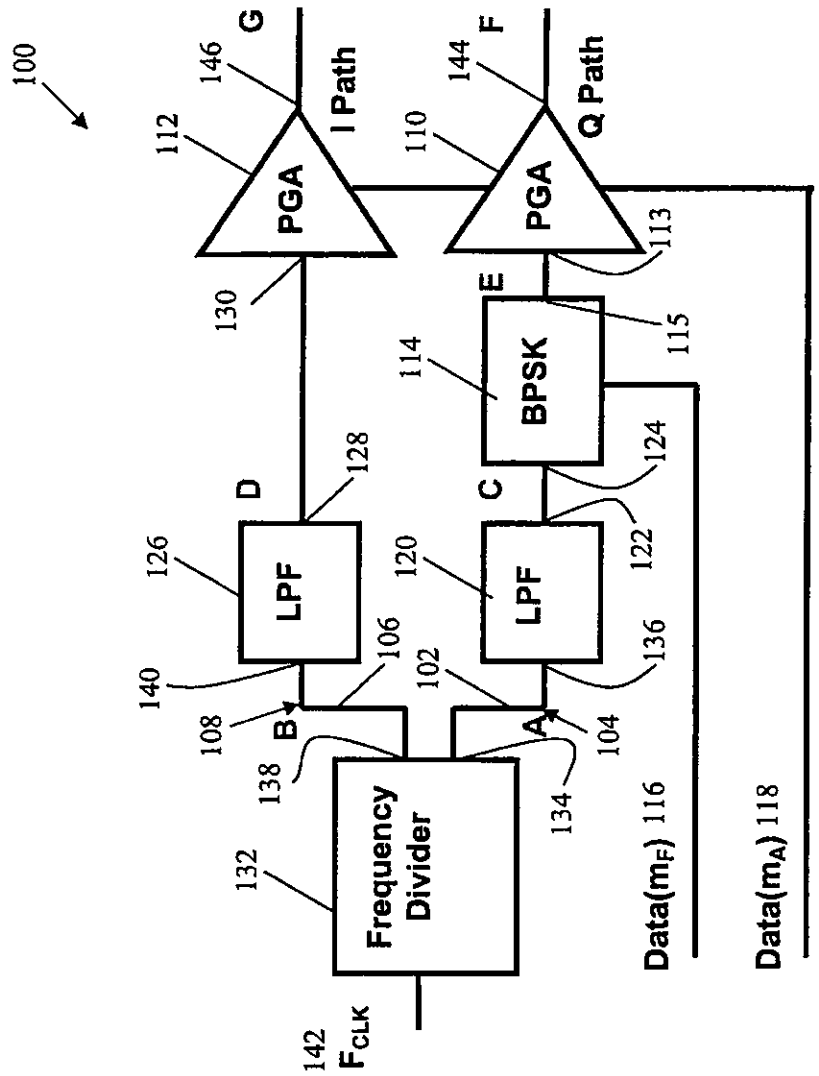
100
146
G
I Path
112
PGA
144
F
Q Path
110
PGA
113
130
E
115
114
BPSK
124
D
128
C
122
126
LPF
120
LPF
106
102
136
140
108
B
A
104
138
134
132
Frequency Divider
Data(m_F) 116
Data(m_A) 118
142
F_CLK

Figure 1

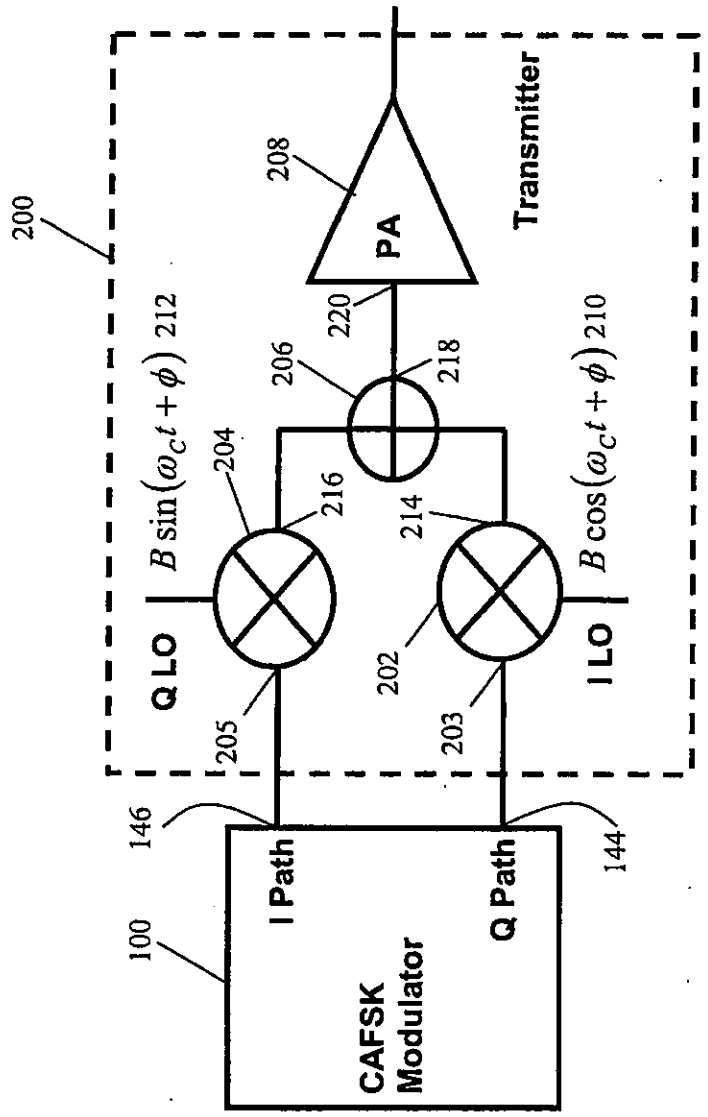
200
208
PA
Transmitter
220
206
218
$B\sin(\omega_C t+\phi)$ 212
$B\cos(\omega_C t+\phi)$ 210
204
216
214
Q LO
I LO
202
205
203
146
144
I Path
Q Path
100
CAFSK
Modulator

Figure 2

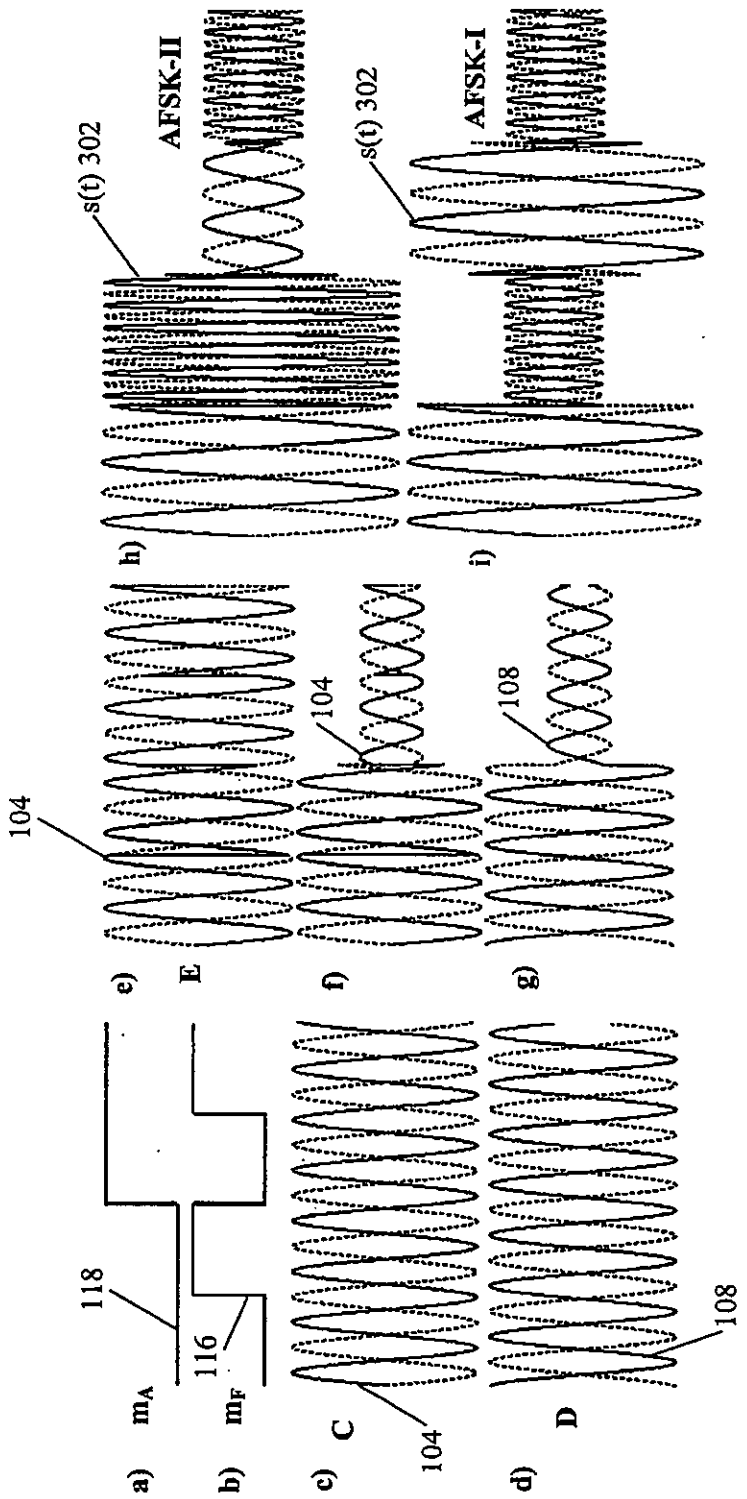
a)
m_A
118
b)
m_F
116
c)
C
104
d)
D
108
e)
E
104
f)
104
g)
108
h)
AFSK-II
s(t) 302
i)
AFSK-I
s(t) 302

Figure 3

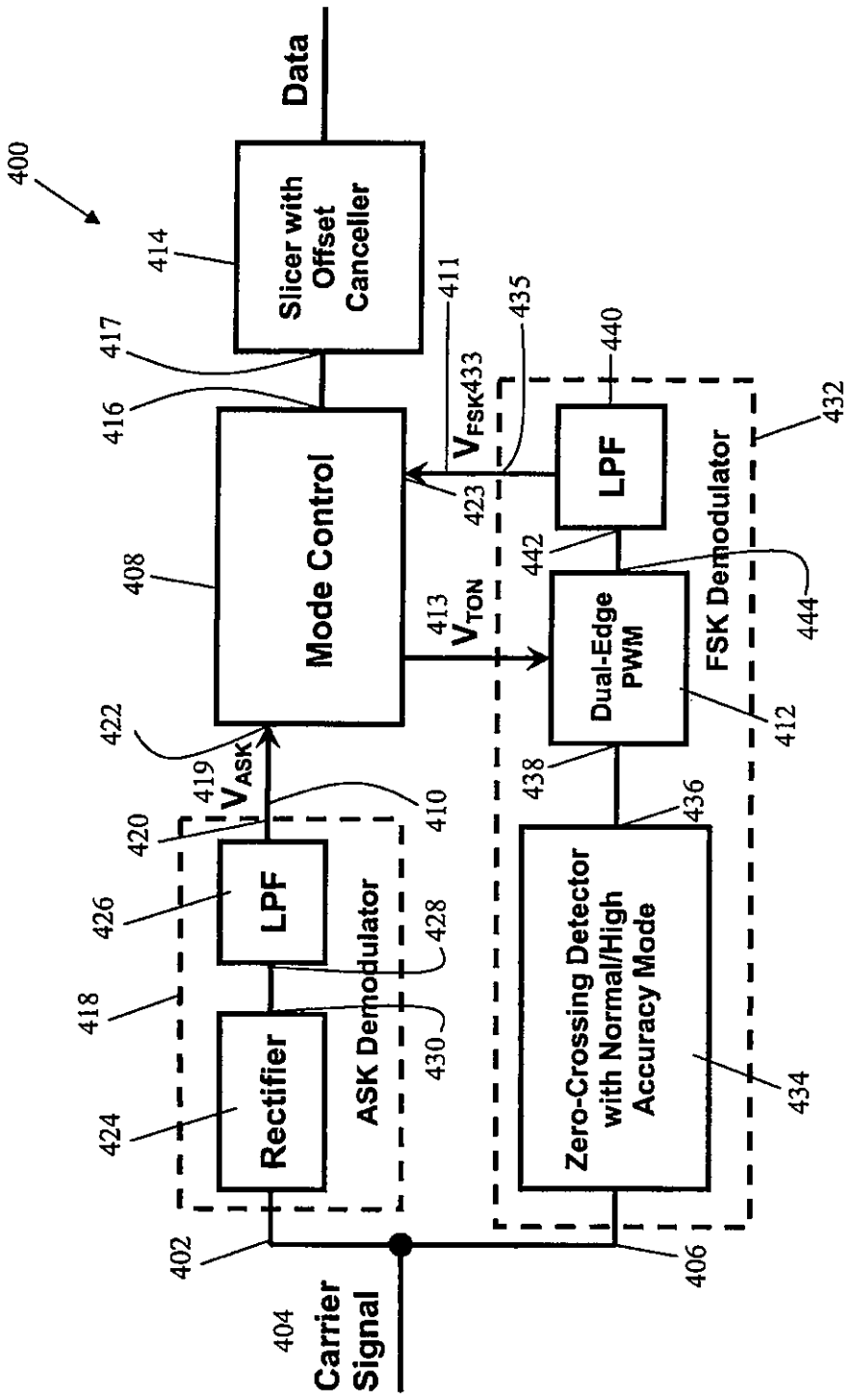
400
Data
414
Slicer with Offset Canceller
411
417
435
440
416
V_{FSK}433
LPF
432
Mode Control
423
442
408
413
V_{TON}
Dual-Edge PWM
FSK Demodulator
444
422
412
438
419
V_{ASK}
410
436
420
426
LPF
428
418
ASK Demodulator
Zero-Crossing Detector with Normal/High Accuracy Mode
430
434
424
Rectifier
402
406
404
Carrier Signal

Figure 4

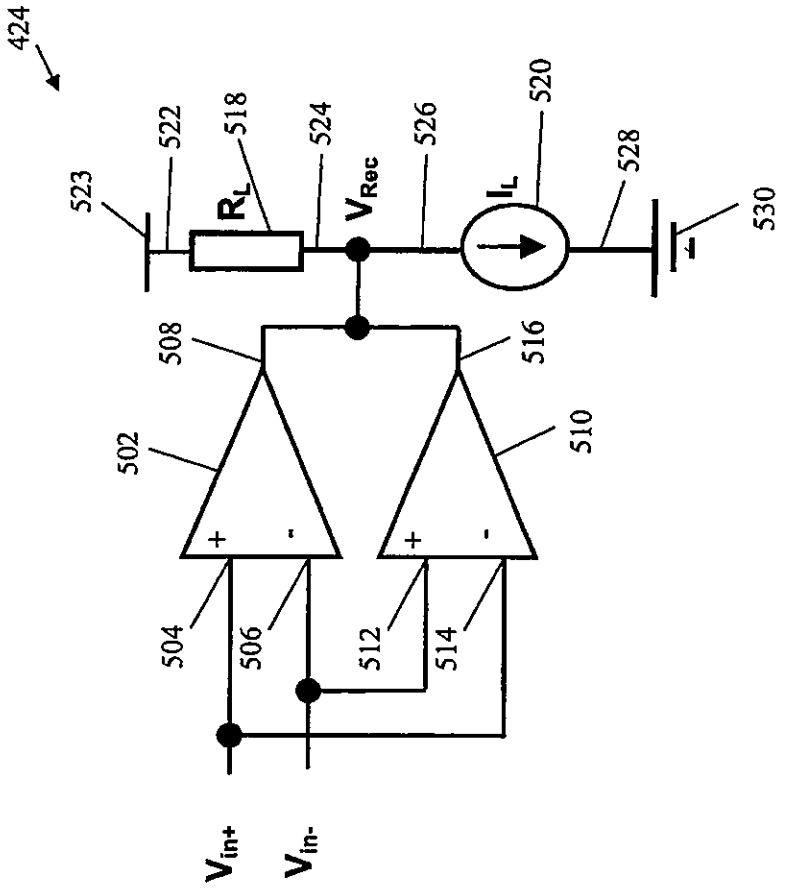
424
522
518
524
526
520
528
523
R_L
V_{Rec}
I_L
530
508
516
502
510
+
-
+
-
504
506
512
514
V_{in+}
V_{in-}

Figure 5

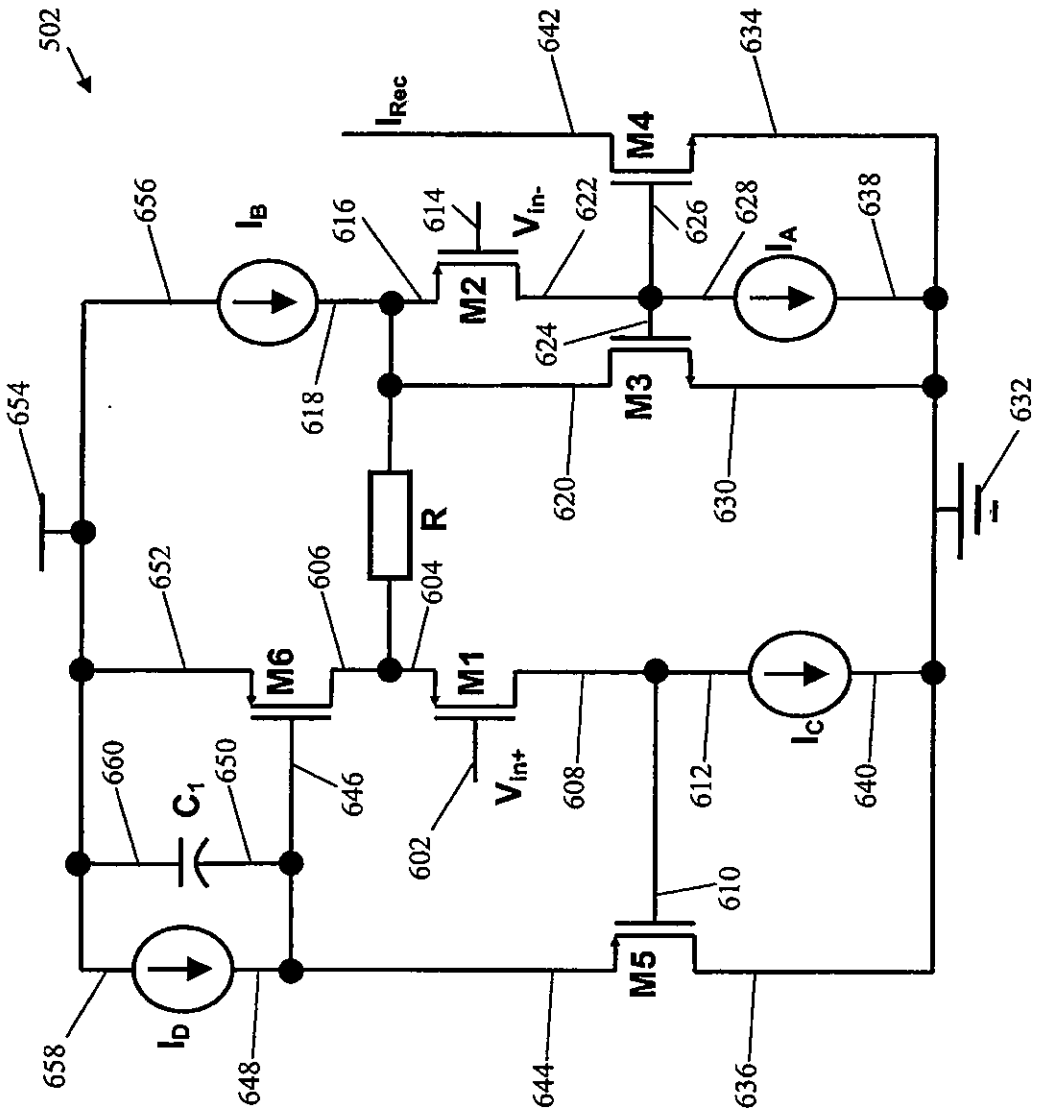
502
642
634
I_{Rec}
M4
656
I_B
616
614
V_{in-}
622
626
628
I_A
638
M2
624
M3
654
618
620
630
632
R
652
606
604
M6
M1
660
C_1
650
646
V_{in+}
608
612
I_C
640
602
610
M5
658
I_D
648
644
636

Figure 6

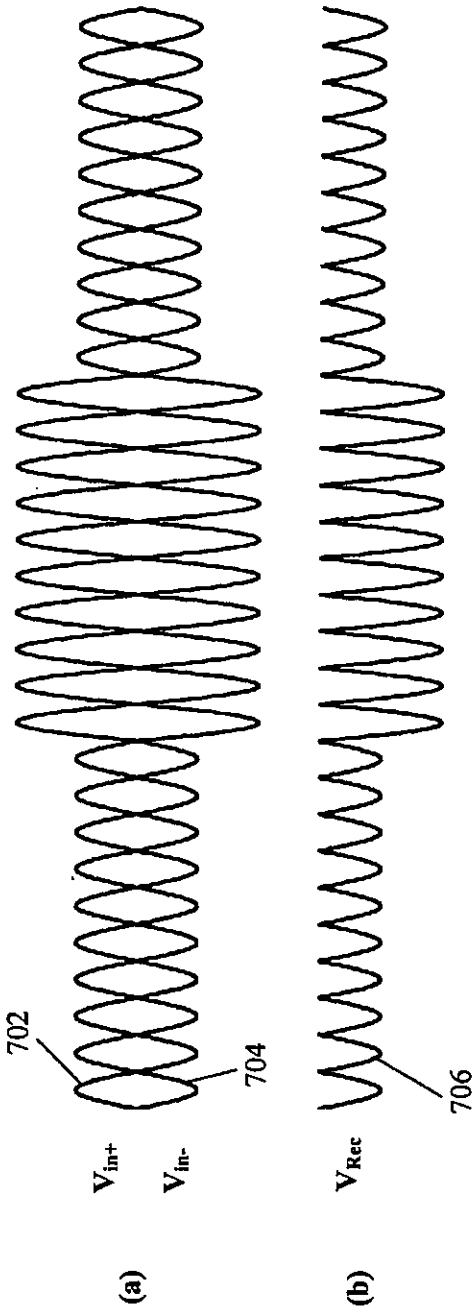

Figure 7

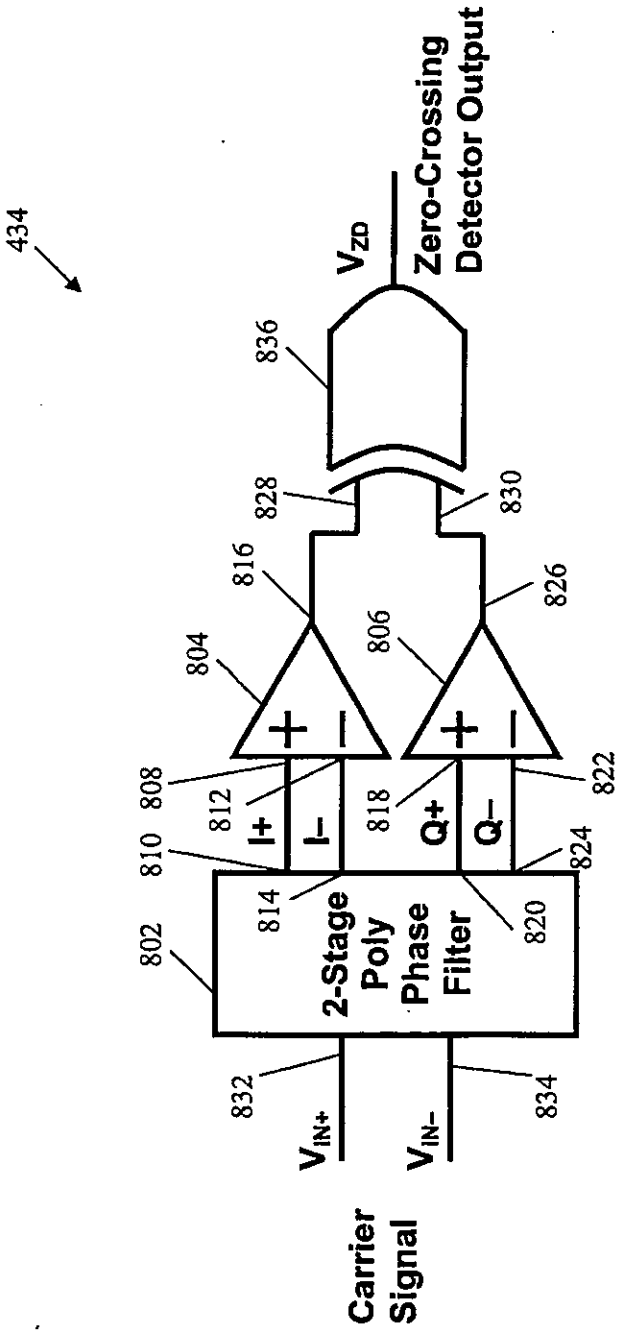
434
Zero-Crossing Detector Output
V_{ZD}
836
828
830
816
826
804
806
808
812
I+
I–
818
Q+
Q–
822
810
824
814
820
802
2-Stage Poly Phase Filter
832
834
V_{IN+}
V_{IN-}
Carrier Signal

Figure 8

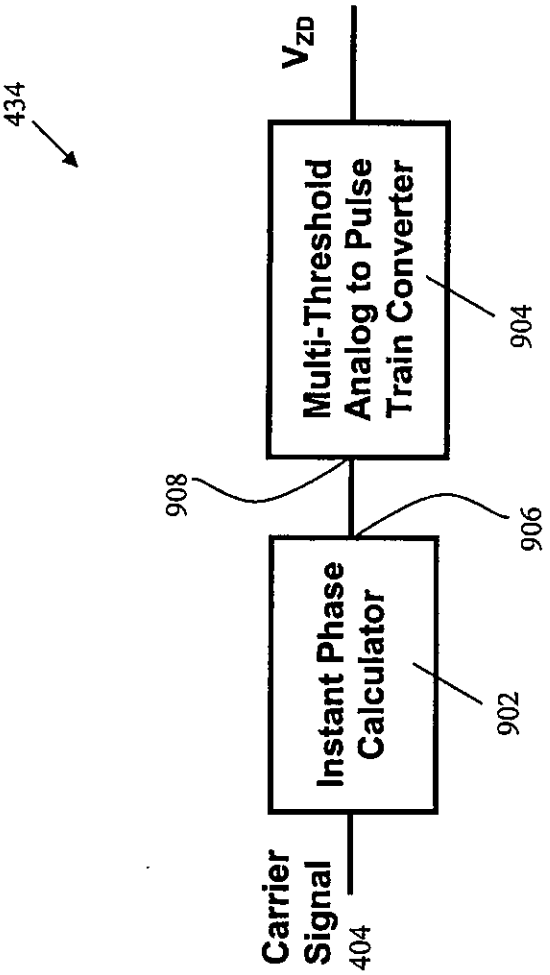
434
V_{ZD}
Multi-Threshold Analog to Pulse Train Converter
904
908
906
Instant Phase Calculator
902
Carrier Signal
404

Figure 9

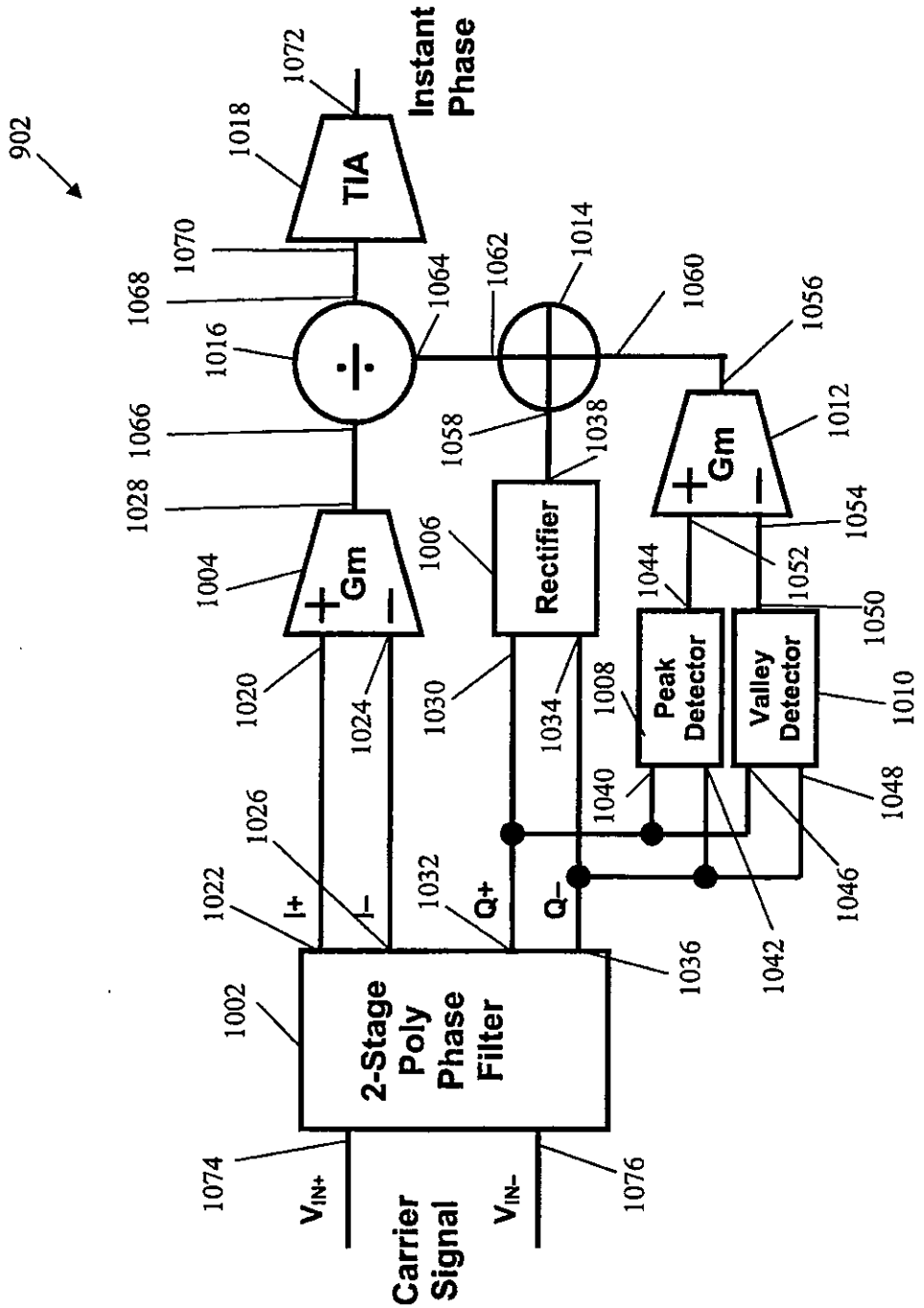
902
TIA
Instant Phase
Gm
Rectifier
Gm
Peak Detector
Valley Detector
2-Stage Poly Phase Filter
I+
I–
Q+
Q–
V_{IN+}
V_{IN-}
Carrier Signal
1002
1004
1006
1008
1010
1012
1014
1016
1018
1020
1022
1024
1026
1028
1030
1032
1034
1036
1038
1040
1042
1044
1046
1048
1050
1052
1054
1056
1058
1060
1062
1064
1066
1068
1070
1072
1074
1076

Figure 10

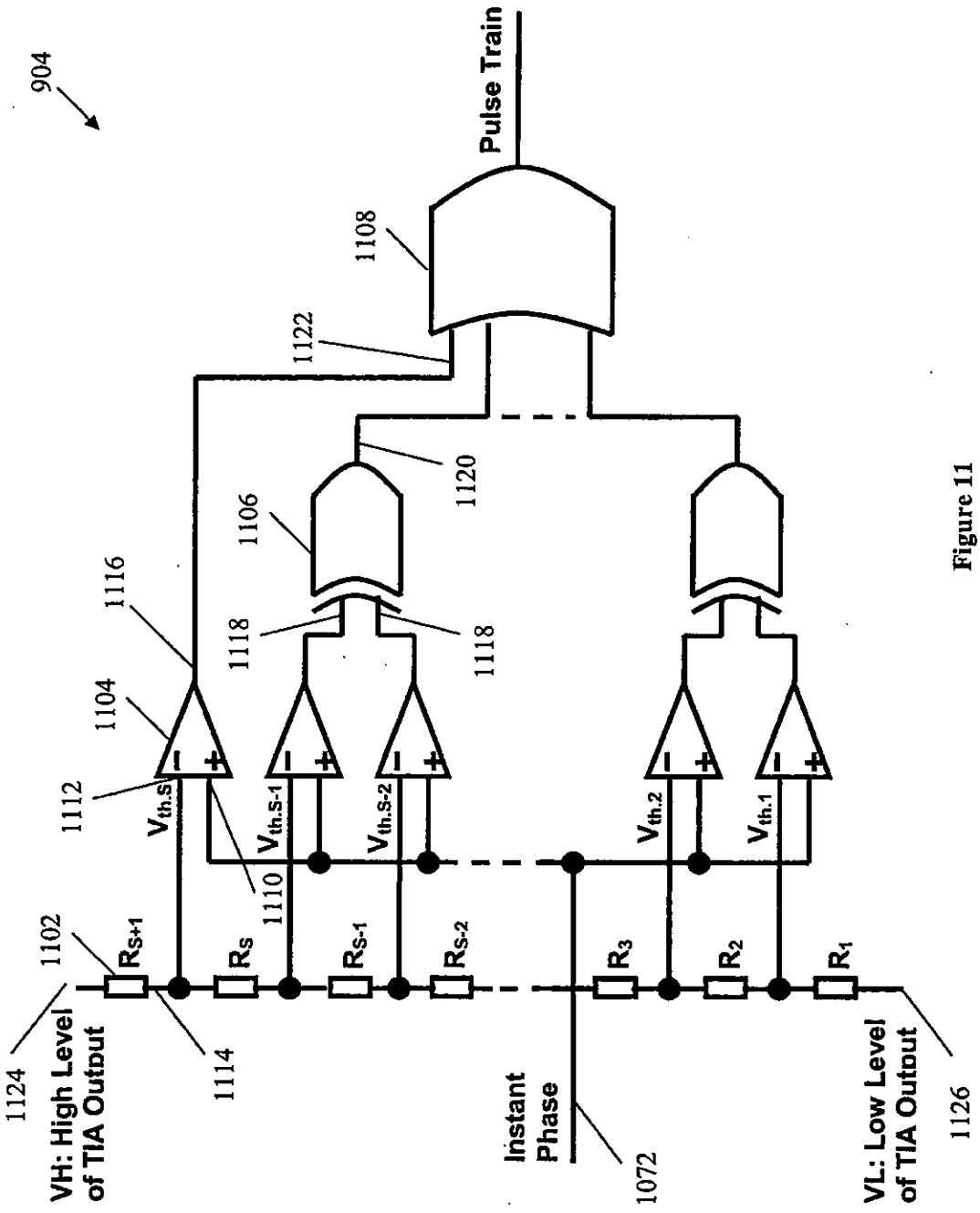
904
Pulse Train
1108
1122
1120
1106
1116
1118
1118
1104
1112
$V_{th.S}$
$V_{th.S-1}$
$V_{th.S-2}$
$V_{th.2}$
$V_{th.1}$
1110
1102
R_{S+1}
R_S
R_{S-1}
R_{S-2}
R_3
R_2
R_1
1124
VH: High Level of TIA Output
1114
Instant Phase
1072
VL: Low Level of TIA Output
1126

Figure 11

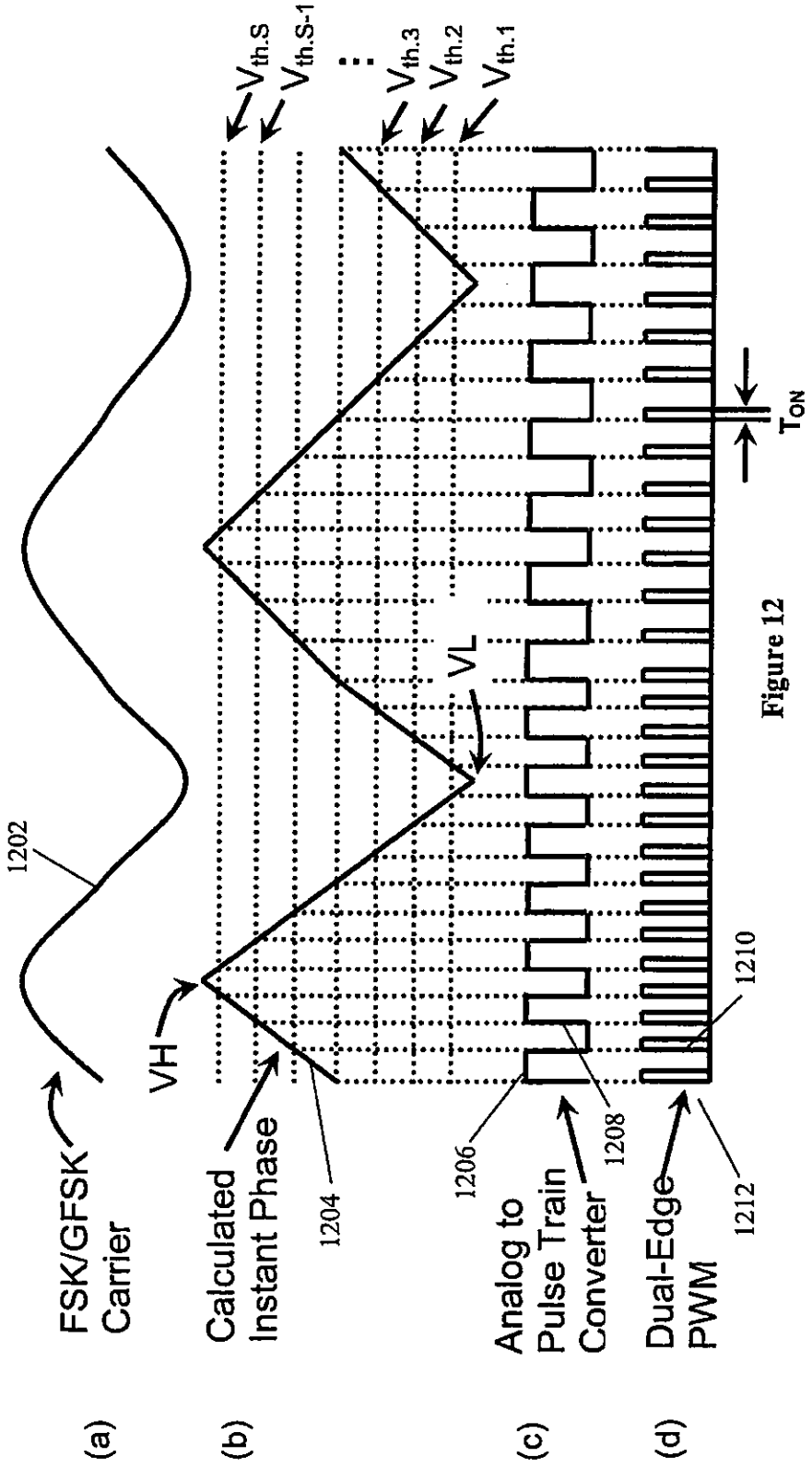
(a)
FSK/GFSK Carrier
1202
(b)
Calculated Instant Phase
VH
VL
$V_{th.S}$
$V_{th.S-1}$
$V_{th.3}$
$V_{th.2}$
$V_{th.1}$
1204
(c)
Analog to Pulse Train Converter
1206
1208
(d)
Dual-Edge PWM
1210
1212
T_{ON}

Figure 12

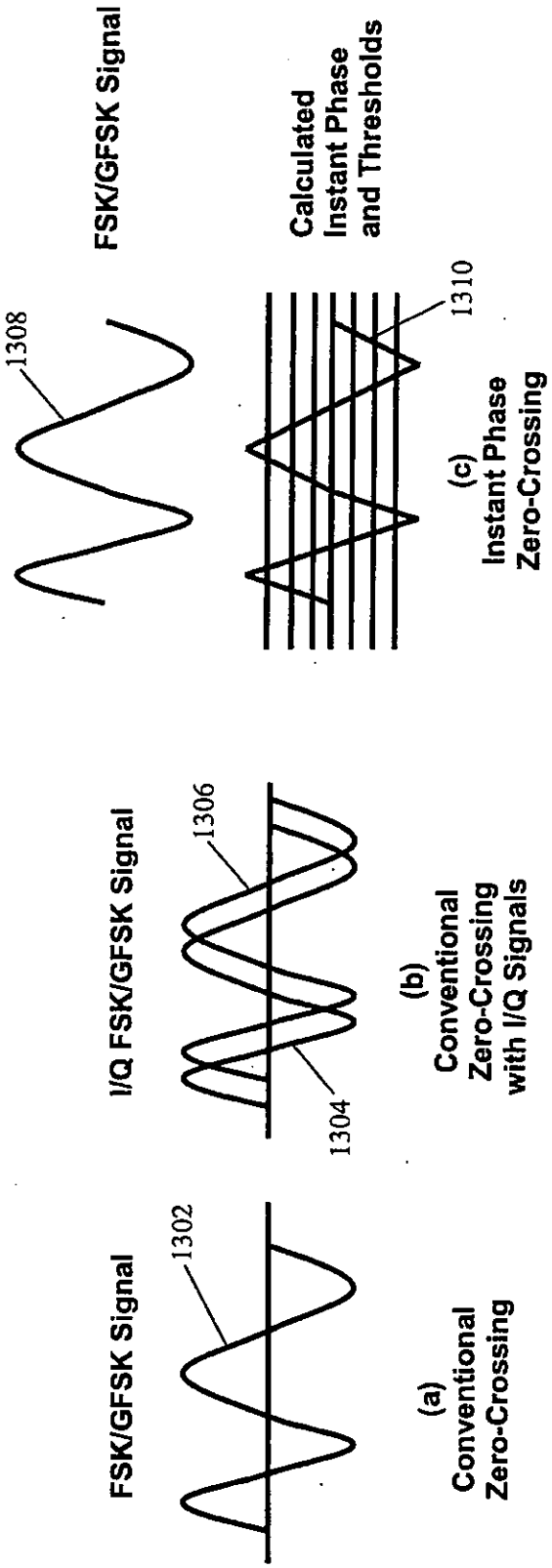
FSK/GFSK Signal
1302
(a)
Conventional
Zero-Crossing
I/Q FSK/GFSK Signal
1306
1304
(b)
Conventional
Zero-Crossing
with I/Q Signals
FSK/GFSK Signal
1308
Calculated
Instant Phase
and Thresholds
1310
(c)
Instant Phase
Zero-Crossing

Figure 13

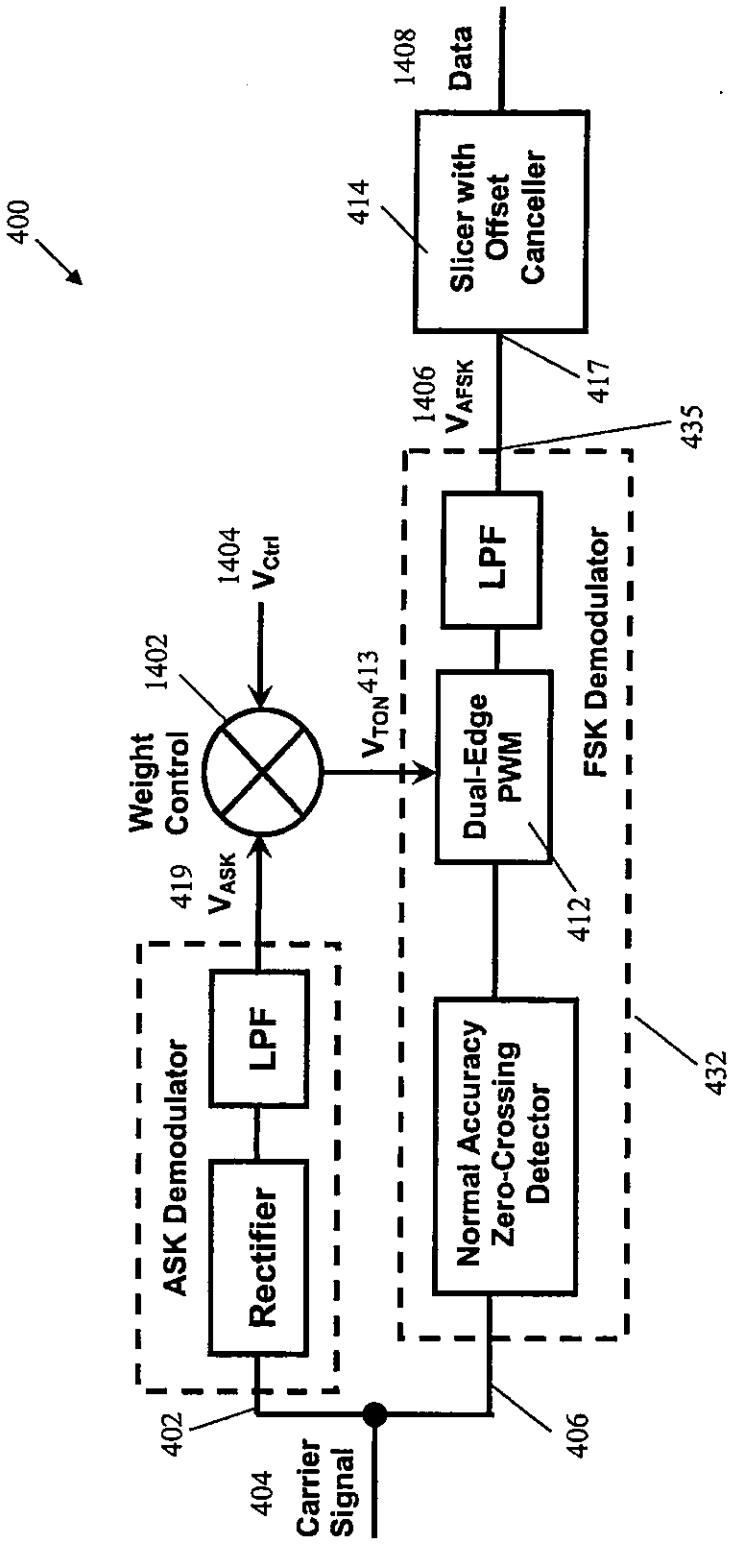
400
1408
Data
414
Slicer with Offset Canceller
1406
V_{AFSK}
417
435
LPF
1404
V_{Ctrl}
1402
Weight Control
V_{TON} 413
Dual-Edge PWM
FSK Demodulator
419
V_{ASK}
412
ASK Demodulator
LPF
Rectifier
Normal Accuracy Zero-Crossing Detector
432
402
406
404
Carrier Signal

Figure 14

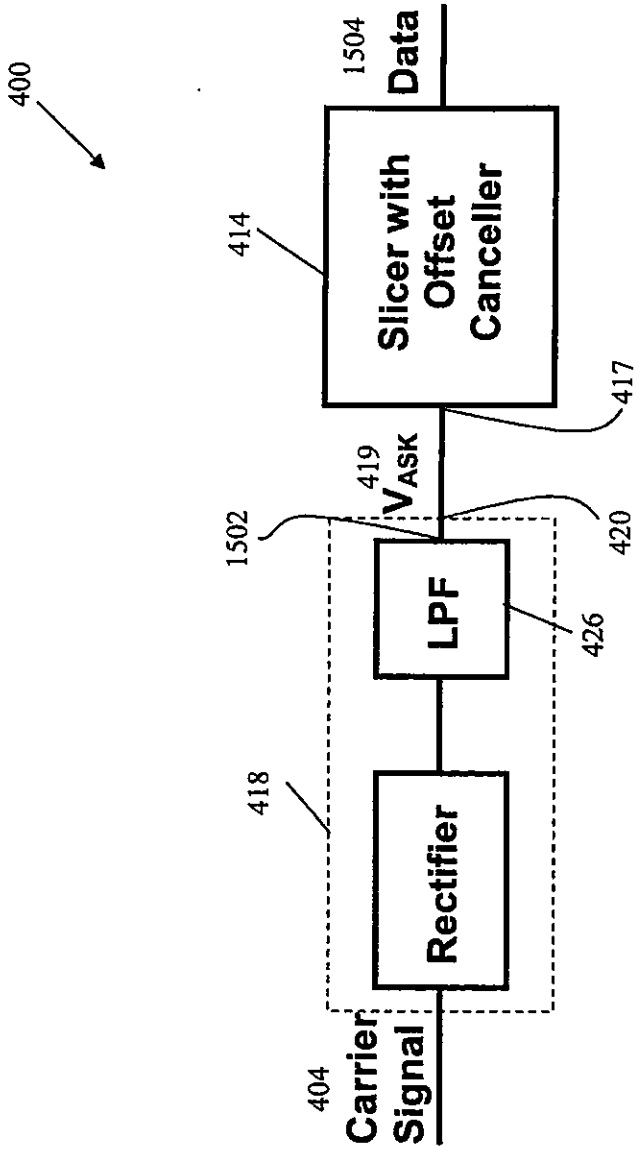
400
1504
Data
414
Slicer with Offset Canceller
417
419
V_{ASK}
1502
420
LPF
426
418
Rectifier
404
Carrier Signal

Figure 15

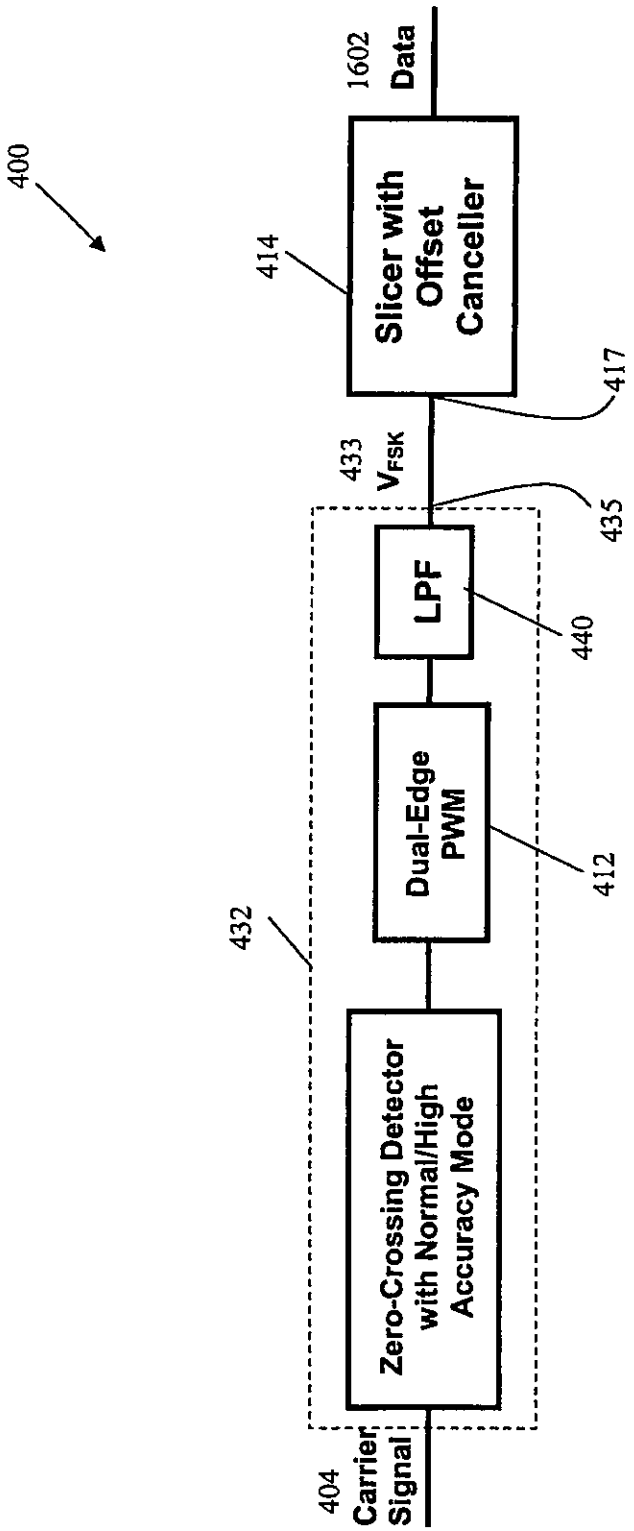
400
414
Slicer with Offset Canceller
1602
Data
417
433
V_{FSK}
435
LPF
440
Dual-Edge PWM
412
432
Zero-Crossing Detector with Normal/High Accuracy Mode
404
Carrier Signal

Figure 16

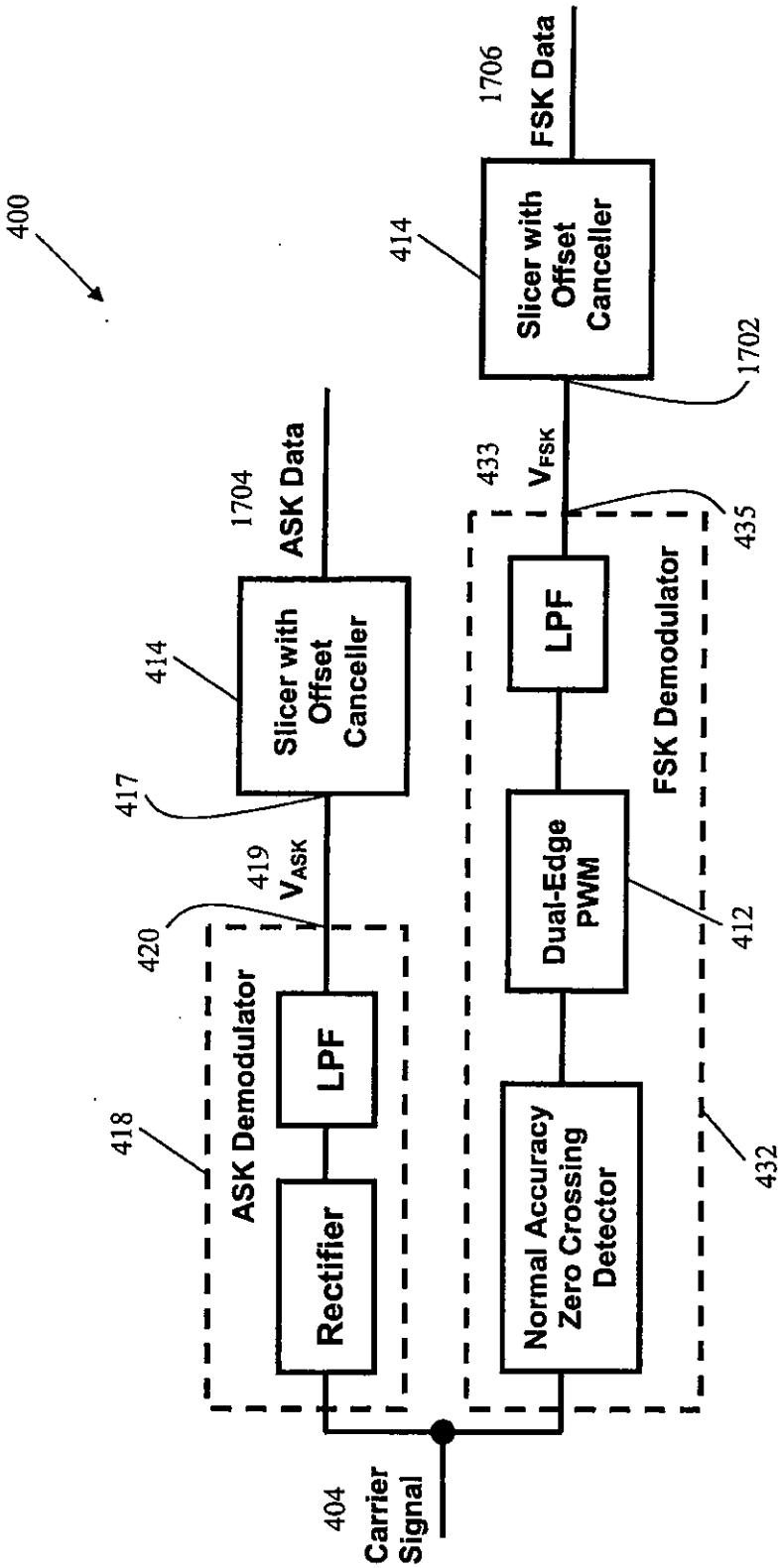
400
404
Carrier Signal
418
ASK Demodulator
Rectifier
LPF
420
419
V_{ASK}
417
414
Slicer with Offset Canceller
1704
ASK Data
FSK Demodulator
Normal Accuracy Zero Crossing Detector
432
Dual-Edge PWM
412
LPF
433
V_{FSK}
435
1702
414
Slicer with Offset Canceller
1706
FSK Data

Figure 17

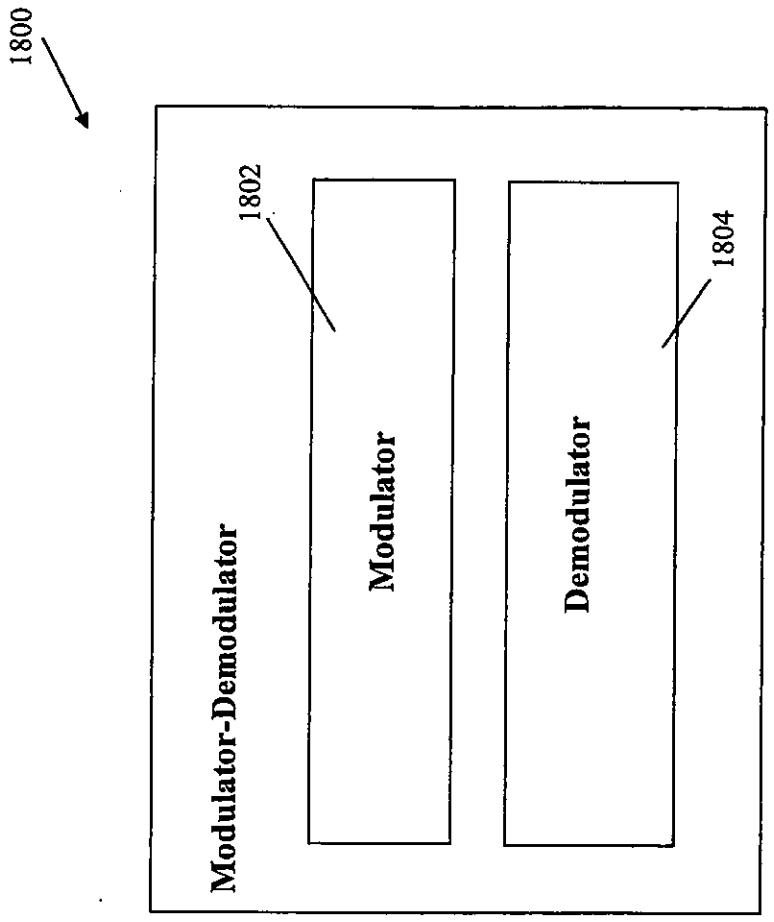
1800
1802
1804
Modulator-Demodulator
Modulator
Demodulator

Figure 18