FIG. 1

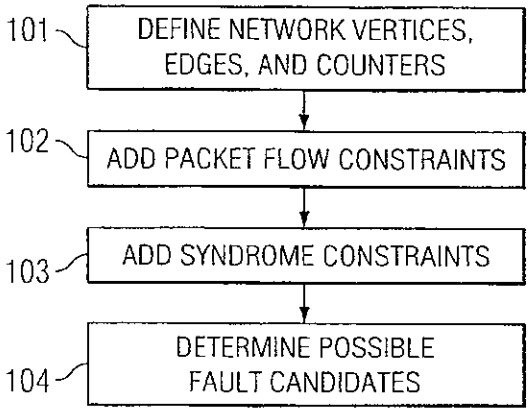

101
DEFINE NETWORK VERTICES, EDGES, AND COUNTERS
102
ADD PACKET FLOW CONSTRAINTS
103
ADD SYNDROME CONSTRAINTS
104
DETERMINE POSSIBLE FAULT CANDIDATES

FIG. 2

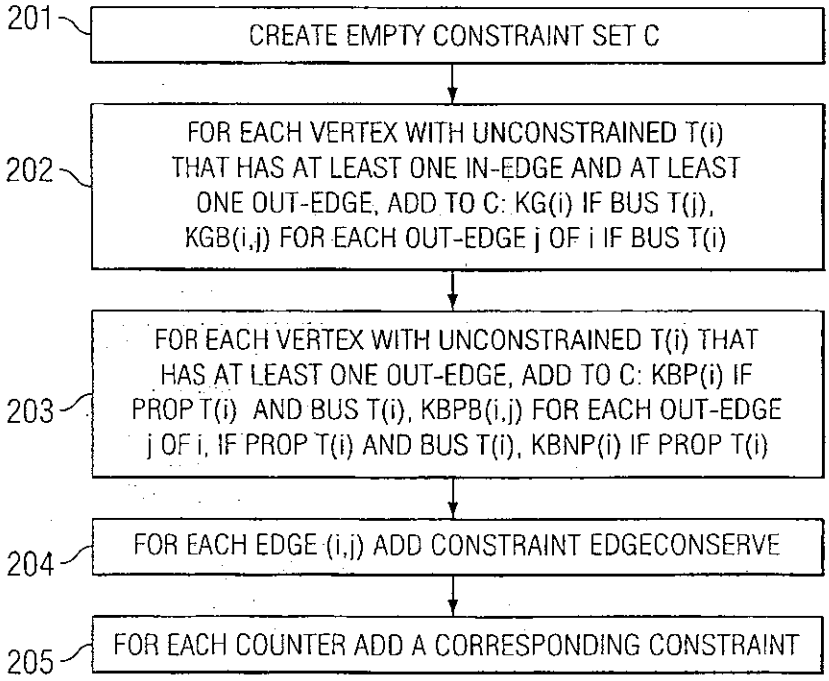

201
CREATE EMPTY CONSTRAINT SET C
202
FOR EACH VERTEX WITH UNCONSTRAINED T(i) THAT HAS AT LEAST ONE IN-EDGE AND AT LEAST ONE OUT-EDGE, ADD TO C: KG(i) IF BUS T(j), KGB(i,j) FOR EACH OUT-EDGE j OF i IF BUS T(i)
203
FOR EACH VERTEX WITH UNCONSTRAINED T(i) THAT HAS AT LEAST ONE OUT-EDGE, ADD TO C: KBP(i) IF PROP T(i) AND BUS T(i), KBPB(i,j) FOR EACH OUT-EDGE j OF i, IF PROP T(i) AND BUS T(i), KBNP(i) IF PROP T(i)
204
FOR EACH EDGE (i,j) ADD CONSTRAINT EDGECONSERVE
205
FOR EACH COUNTER ADD A CORRESPONDING CONSTRAINT

FIG. 3

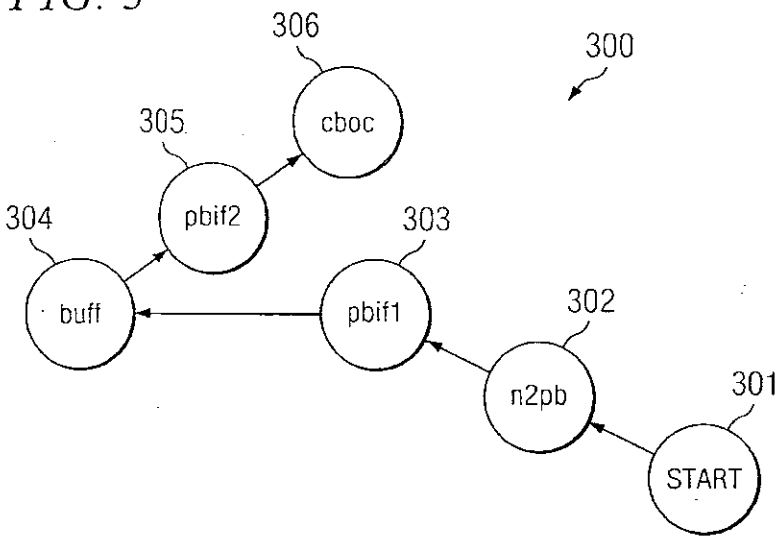


FIG. 4

400

```
g_start_n2pb - gd_start_n2pb - mb_start_n2pb - g_n2pb_pbif1 = 0;
  b_start_n2pb - bd_start_n2pb + mb_start_n2pb - b_n2pb_pbif1 = 0;
  g_n2pb_pbif1 - gd_n2pb_pbif1 - mb_n2pb_pbif - g_pbif1_buff = 0;
  b_pbif1_buff = 0;
  g_pbif1_buff - gd_pbif1_buff - mb_pbif_buff - g_buff_pbif2 = 0;
  b_pbif1_buff - bd_pbif1_buff + mb_pbif_buff - b_buff_pbif2 = 0;
  g_buff_pbif2 - gd_buff_pbif2 - mb_buff_pbif - g_pbif2_cboc = 0;
  b_pbif2_cboc = 0;
  gd_start_n2pb + mb_start_n2pb <= g_start_n2pb;
  bd_start_n2pb <= b_start_n2pb;
  gd_n2pb_pbif1 + mb_n2pb_pbif <= g_n2pb_pbif1;
  bd_n2pb_pbif1 <= b_n2pb_pbif1;
  gd_pbif1_buff + mb_pbif_buff <= g_pbif1_buff;
  bd_pbif1_buff <= b_pbif1_buff;
  gd_buff_pbif2 + mb_buff_pbif<=g_buff_pbif2;
  bd_biff_pbif2 <= b_buff1_pbif;
  g_start_n2pb = psi_1;
  g_start_n2pb - gd_start_n2pb - mb_start_n2pb = psi_2;
  g_n2pb_pbif1 - gd_n2pb_pbif1 - mb_n2pb_pbif +
                  g_buff_pbif2 - gd_buff_pbif2 - mb_buff_pbif = psi_3;
  g_pbif2_cboc - gd_pbif2_cboc - mb_pbif_cboc = psi_4;
  g_pbif1_buff - gd_pbif1_buff - mb_pbif_buff = psi_5;
```

FIG. 5

500

FAULT HYPOTHESIS	SYN. 1	SYN. 2	SYN. 3	SYN. 4	SYN. 5
edge start->n2pb	1	0	0	0	0
edge n2pb->pbif	0	1	0	0	0
edge pbif->buff	0	0	1	1	0
edge biff->pbif	0	0	1	1	0
edge pbif->cboc	0	0	0	0	1

FIG. 6

600

FAULT HYPOTHESIS	SYN. 1	SYN. 2	SYN. 3	SYN. 4	SYN. 5
edge start->n2pb	1	0	0	0	0
edge n2pb->pbif	0	1	0	0	0
edge pbif->buff	0	0	1	0	0
edge biff->pbif	0	0	0	1	0
edge pbif->cboc	0	0	0	0	1

FIG. 8

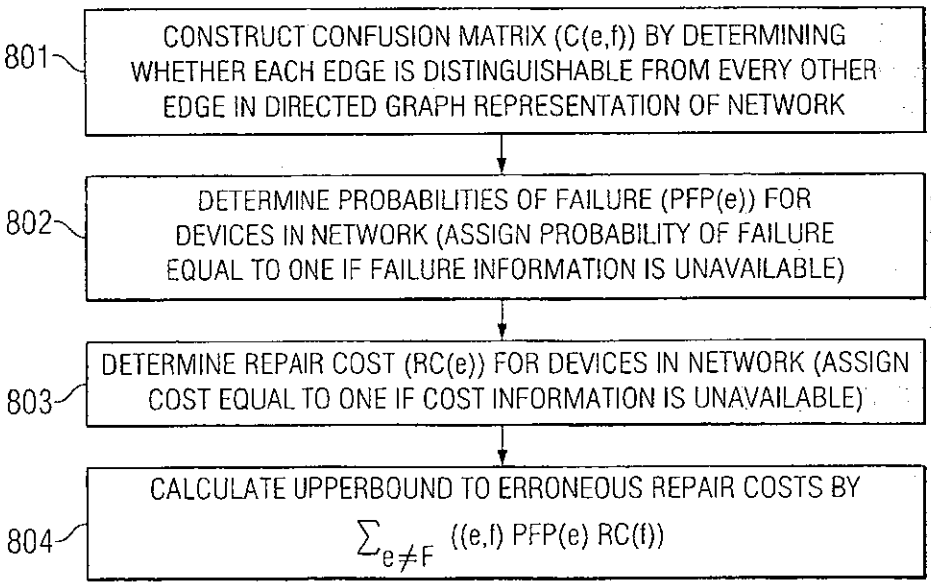


FIG. 7

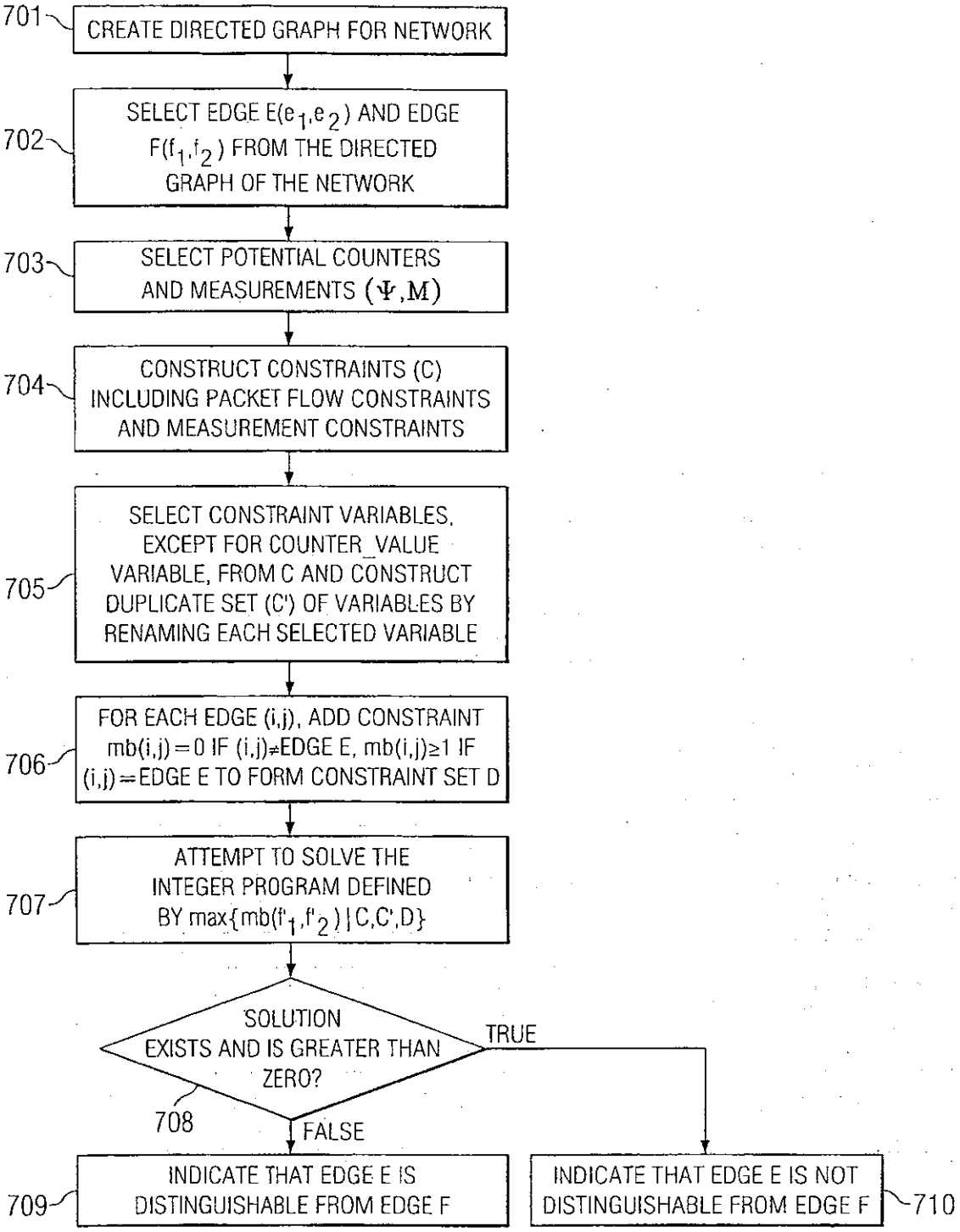

701
CREATE DIRECTED GRAPH FOR NETWORK
702
SELECT EDGE E(e_1,e_2) AND EDGE F(f_1,f_2) FROM THE DIRECTED GRAPH OF THE NETWORK
703
SELECT POTENTIAL COUNTERS AND MEASUREMENTS (Ψ,M)
704
CONSTRUCT CONSTRAINTS (C) INCLUDING PACKET FLOW CONSTRAINTS AND MEASUREMENT CONSTRAINTS
705
SELECT CONSTRAINT VARIABLES, EXCEPT FOR COUNTER_VALUE VARIABLE, FROM C AND CONSTRUCT DUPLICATE SET (C') OF VARIABLES BY RENAMING EACH SELECTED VARIABLE
706
FOR EACH EDGE (i,j), ADD CONSTRAINT mb(i,j) = 0 IF (i,j)≠EDGE E, mb(i,j)≥1 IF (i,j) = EDGE E TO FORM CONSTRAINT SET D
707
ATTEMPT TO SOLVE THE INTEGER PROGRAM DEFINED BY max{mb(f'_1,f'_2) | C,C',D}
SOLUTION EXISTS AND IS GREATER THAN ZERO?
TRUE
708
FALSE
709
INDICATE THAT EDGE E IS DISTINGUISHABLE FROM EDGE F
INDICATE THAT EDGE E IS NOT DISTINGUISHABLE FROM EDGE F
710

FIG. 9

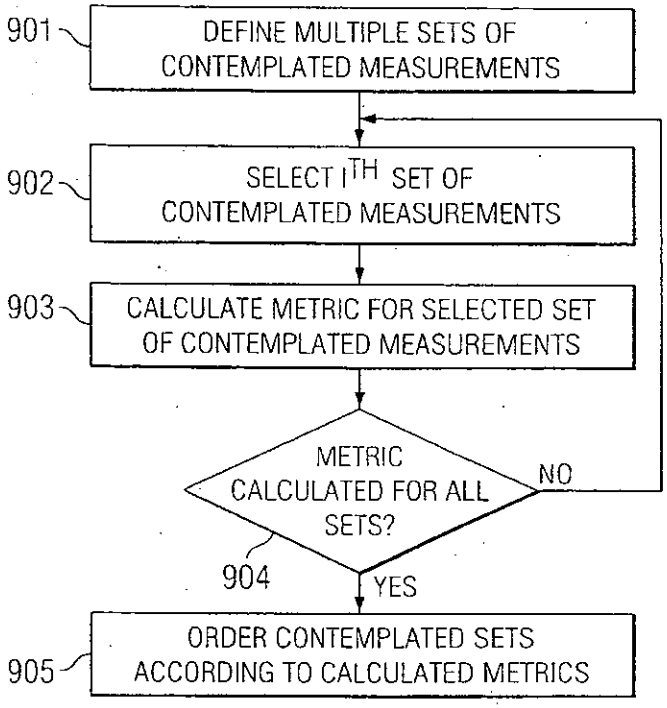
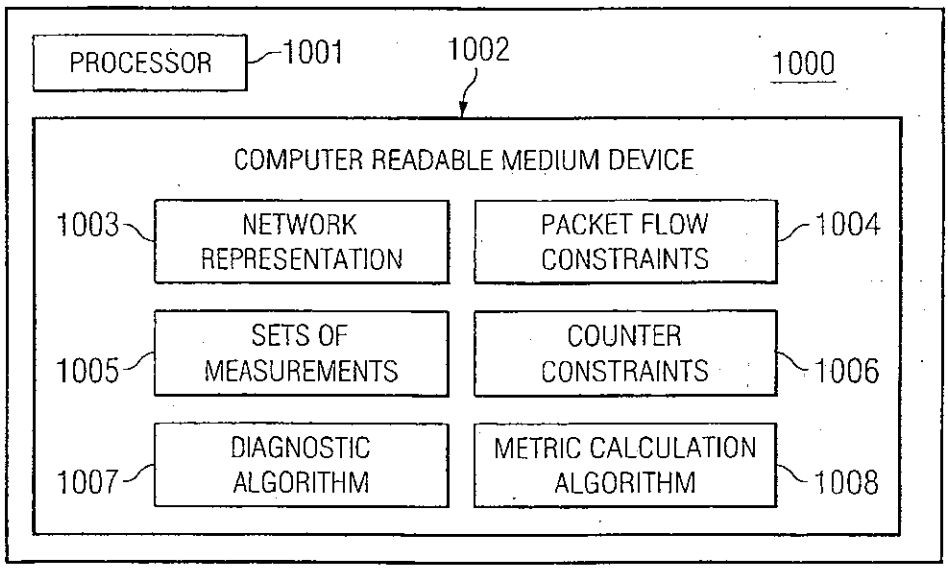

901
DEFINE MULTIPLE SETS OF CONTEMPLATED MEASUREMENTS
902
SELECT I^TH SET OF CONTEMPLATED MEASUREMENTS
903
CALCULATE METRIC FOR SELECTED SET OF CONTEMPLATED MEASUREMENTS
METRIC CALCULATED FOR ALL SETS?
NO
904
YES
905
ORDER CONTEMPLATED SETS ACCORDING TO CALCULATED METRICS

FIG. 10


PROCESSOR
1001
1002
1000
COMPUTER READABLE MEDIUM DEVICE
1003
NETWORK REPRESENTATION
PACKET FLOW CONSTRAINTS
1004
1005
SETS OF MEASUREMENTS
COUNTER CONSTRAINTS
1006
1007
DIAGNOSTIC ALGORITHM
METRIC CALCULATION ALGORITHM
1008