FIG. 1a

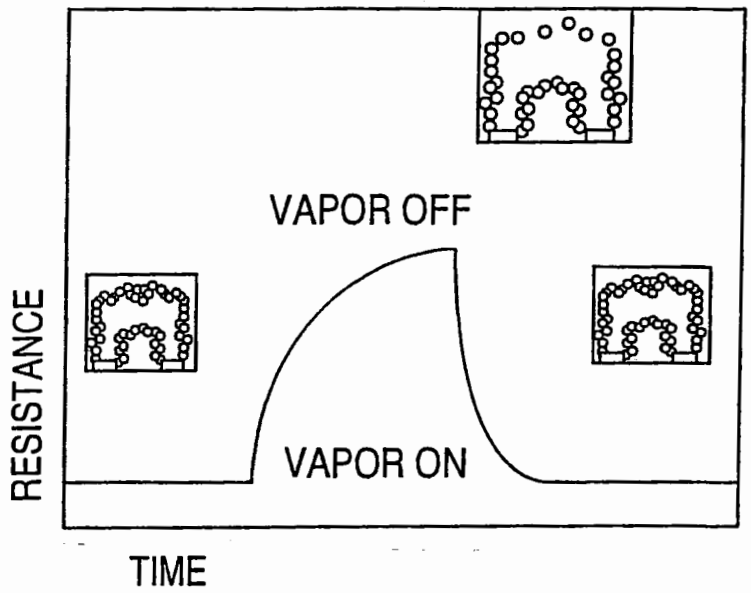


FIG. 1b

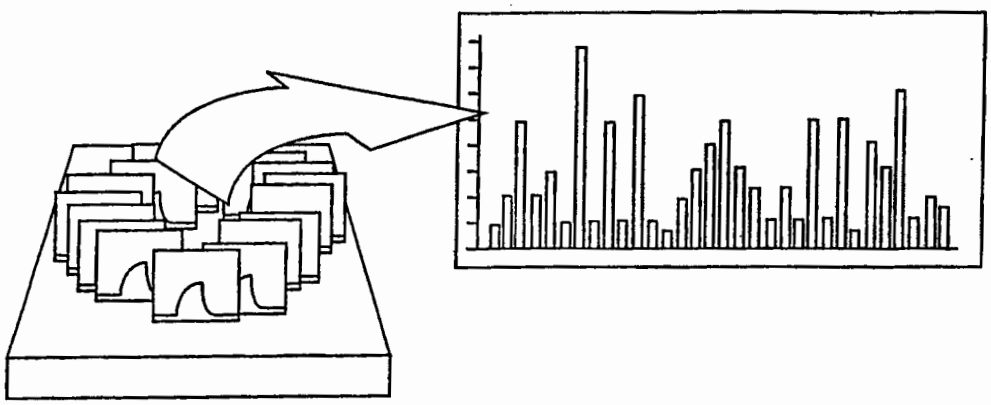


FIG. 2

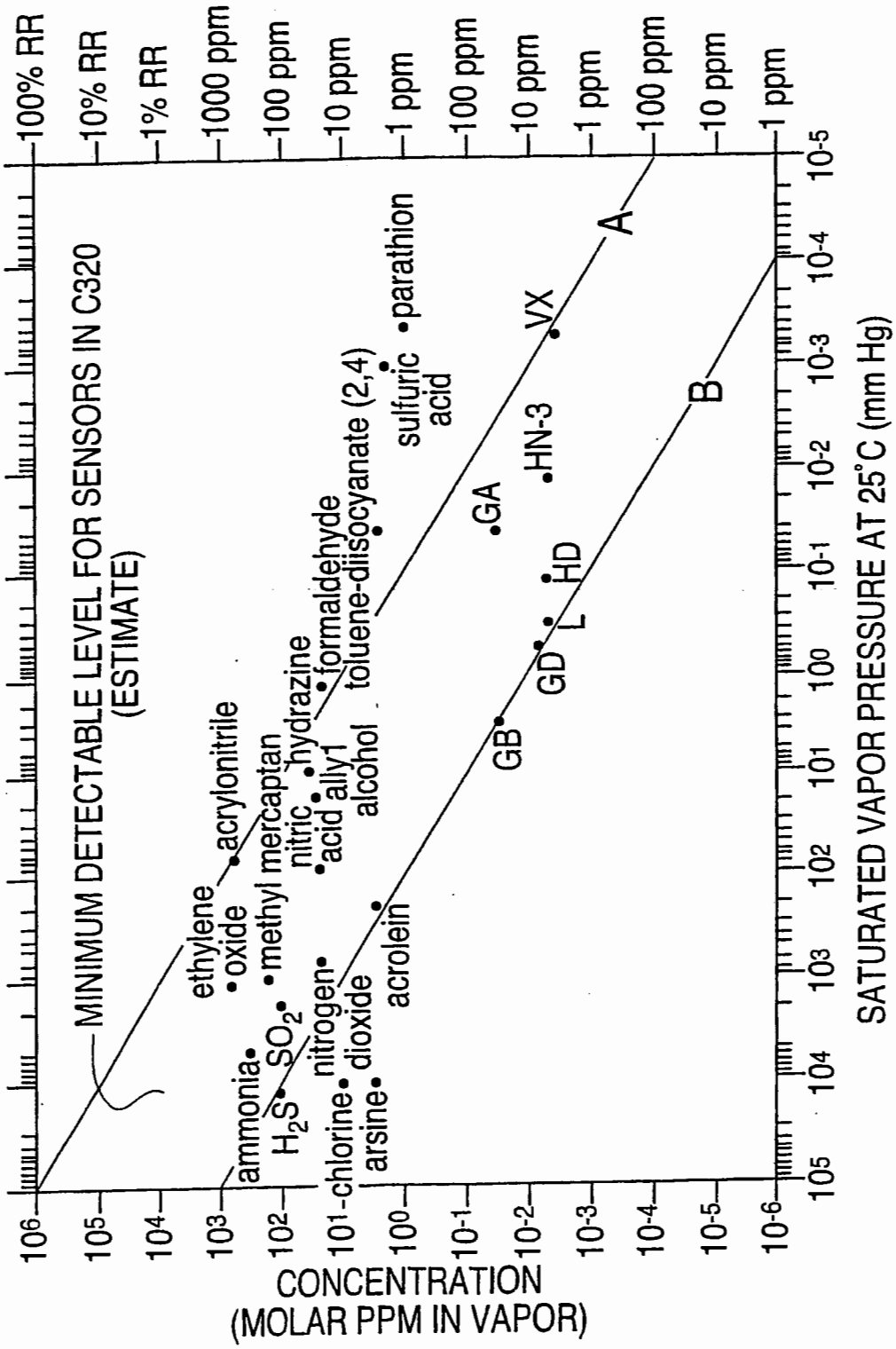

MINIMUM DETECTABLE LEVEL FOR SENSORS IN C320
(ESTIMATE)
100% RR
10% RR
1% RR
1000 ppm
100 ppm
10 ppm
1 ppm
100 ppm
10 ppm
1 ppm
100 ppm
10 ppm
1 ppm
ethylene oxide
acrylonitrile
methyl mercaptan
nitric acid
allyl alcohol
hydrazine
formaldehyde
toluene-diisocyanate (2,4)
sulfuric acid
parathion
GA
HN-3
VX
A
B
GB
GD
L
HD
ammonia
H_2S
SO_2
nitrogen dioxide
chlorine
arsine
acrolein
10^6 10^5 10^4 10^3 10^2 10^1 10^0 10^{-1} 10^{-2} 10^{-3} 10^{-4} 10^{-5} 10^{-6}
CONCENTRATION
(MOLAR PPM IN VAPOR)
10^5 10^4 10^3 10^2 10^1 10^0 10^{-1} 10^{-2} 10^{-3} 10^{-4} 10^{-5}
SATURATED VAPOR PRESSURE AT 25°C (mm Hg)

FIG. 3a

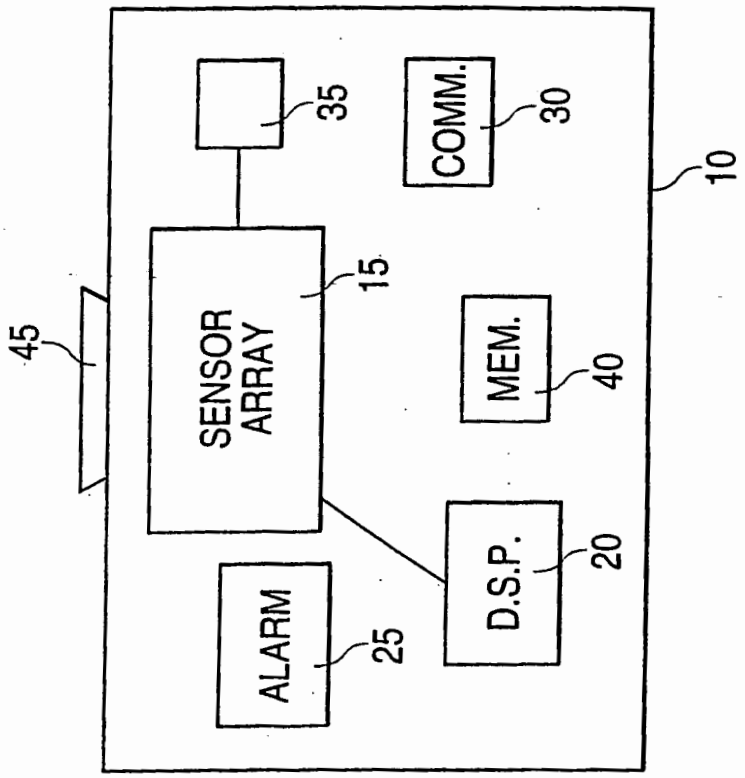
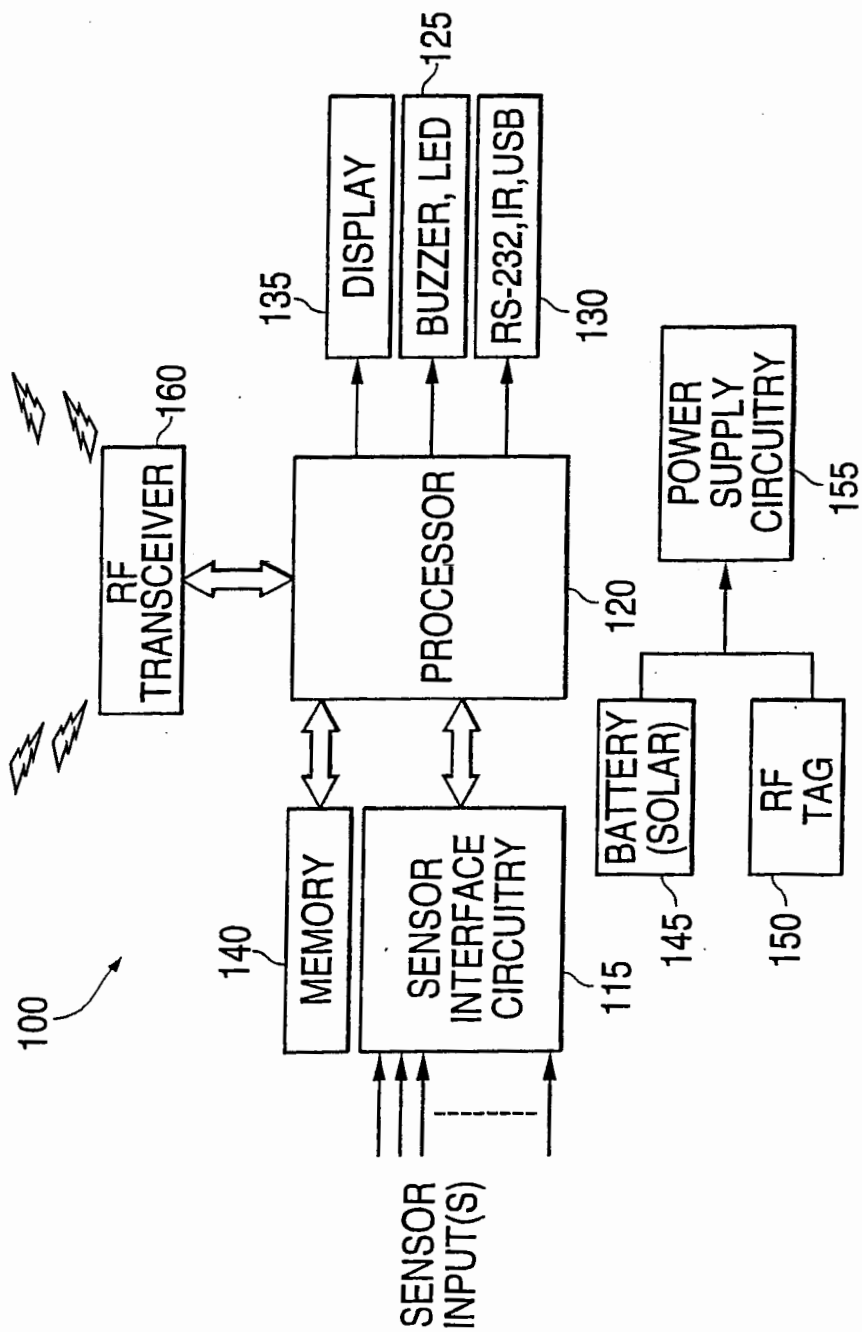


FIG. 3b


100
SENSOR INPUT(S)
SENSOR INTERFACE CIRCUITRY
115
MEMORY
140
BATTERY (SOLAR)
145
RF TAG
150
PROCESSOR
120
RF TRANSCEIVER
160
DISPLAY
135
BUZZER, LED
RS-232,IR,USB
125
130
POWER SUPPLY CIRCUITRY
155

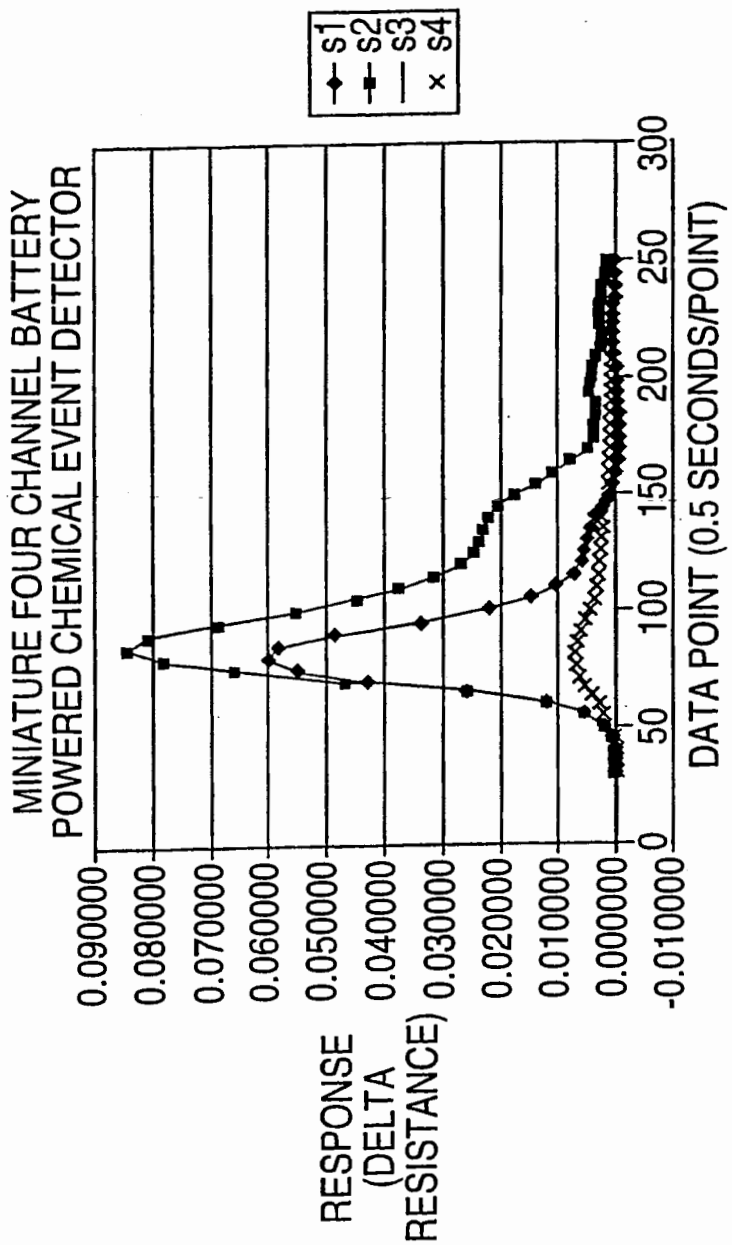

MINIATURE FOUR CHANNEL BATTERY
POWERED CHEMICAL EVENT DETECTOR
s1
s2
s3
s4
RESPONSE
(DELTA
RESISTANCE)
0.090000
0.080000
0.070000
0.060000
0.050000
0.040000
0.030000
0.020000
0.010000
0.000000
-0.010000
0
50
100
150
200
250
300
DATA POINT (0.5 SECONDS/POINT)

FIG. 4

FIG. 5

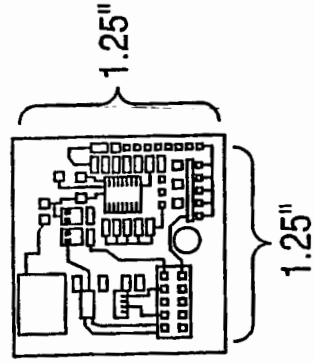


FIG. 6

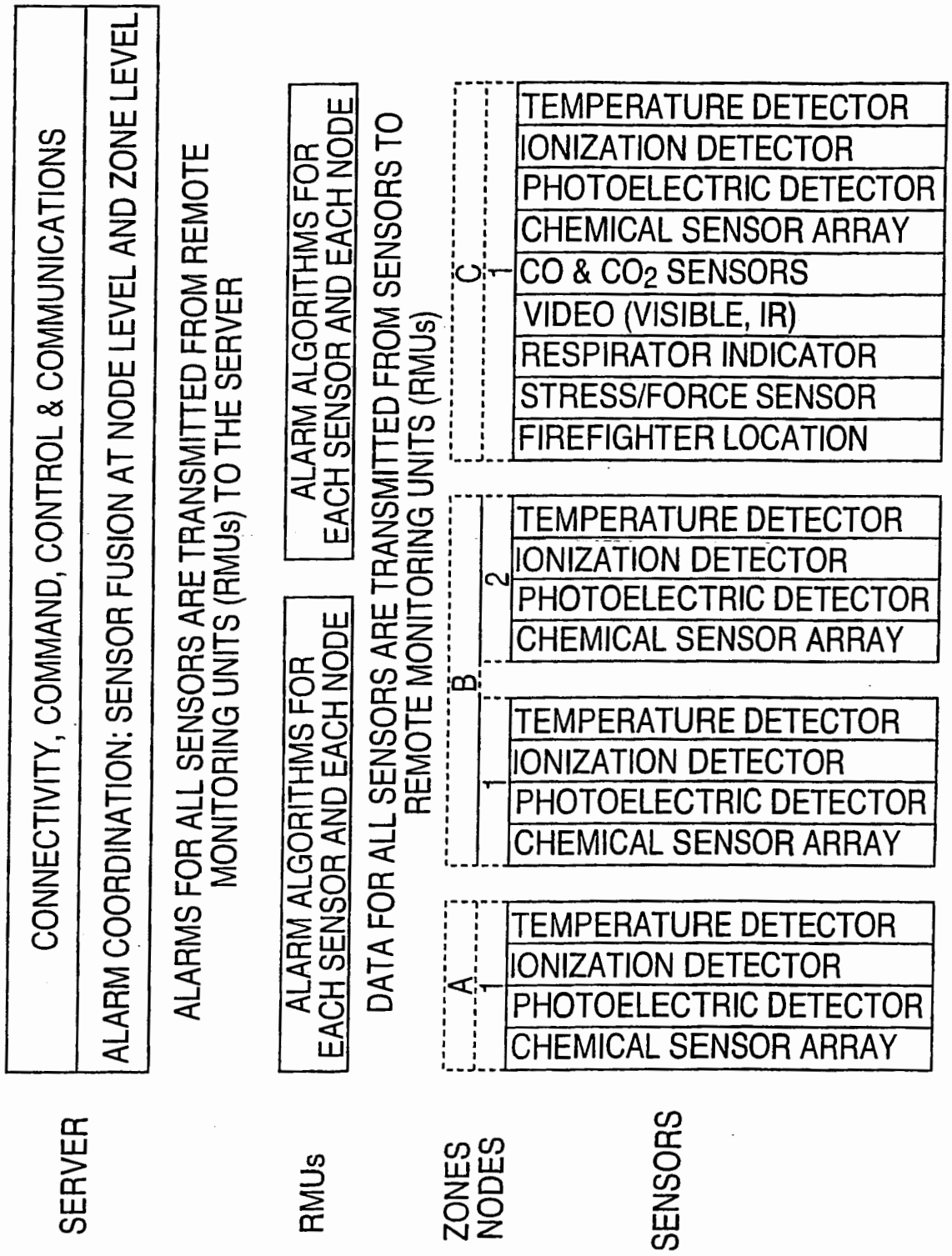
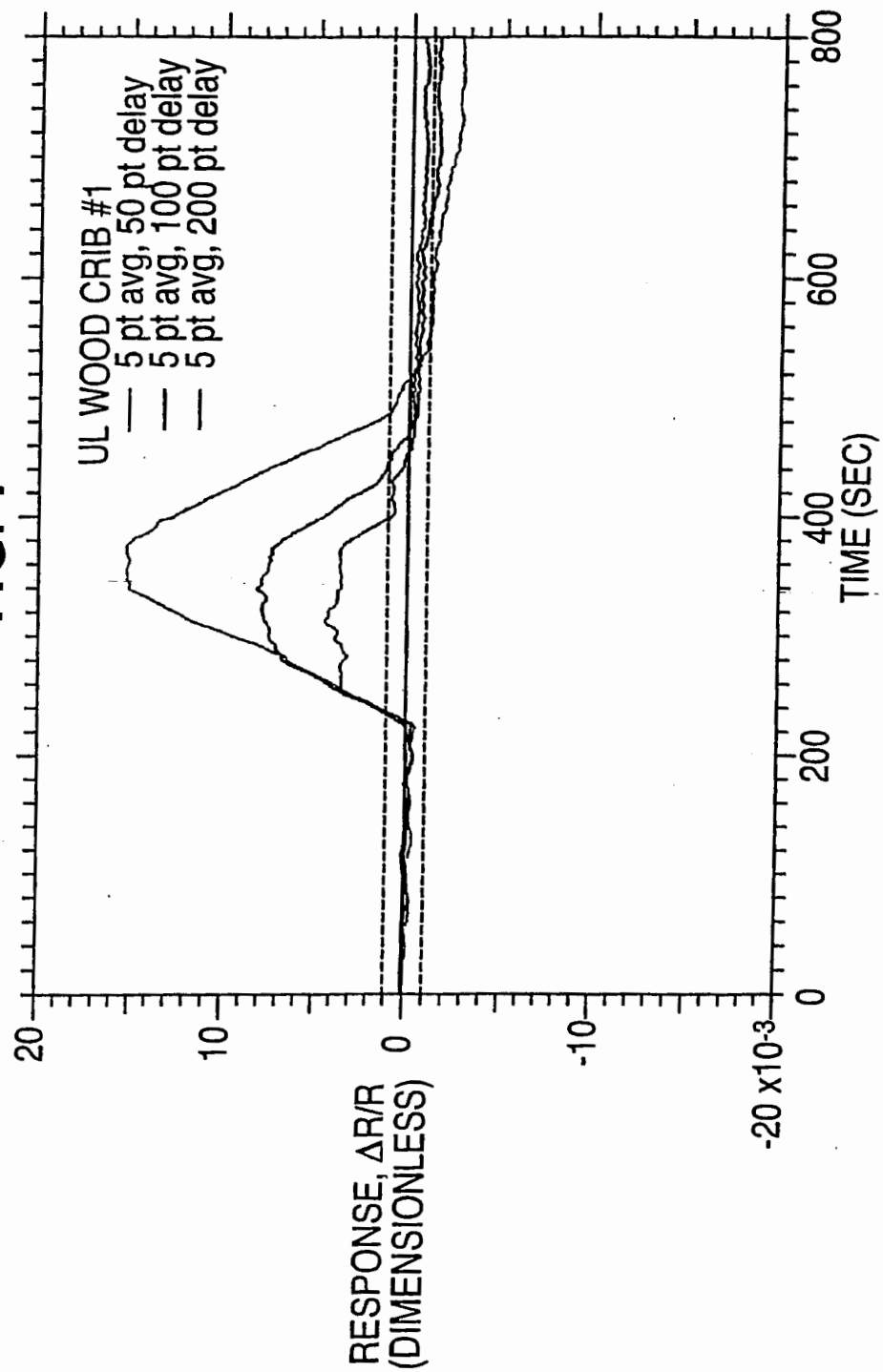

SERVER
CONNECTIVITY, COMMAND, CONTROL & COMMUNICATIONS
ALARM COORDINATION: SENSOR FUSION AT NODE LEVEL AND ZONE LEVEL
ALARMS FOR ALL SENSORS ARE TRANSMITTED FROM REMOTE MONITORING UNITS (RMUs) TO THE SERVER
RMUs
ALARM ALGORITHMS FOR EACH SENSOR AND EACH NODE
ALARM ALGORITHMS FOR EACH SENSOR AND EACH NODE
DATA FOR ALL SENSORS ARE TRANSMITTED FROM SENSORS TO REMOTE MONITORING UNITS (RMUs)
ZONES
NODES
SENSORS
A
1
TEMPERATURE DETECTOR
IONIZATION DETECTOR
PHOTOELECTRIC DETECTOR
CHEMICAL SENSOR ARRAY
B
1
TEMPERATURE DETECTOR
IONIZATION DETECTOR
PHOTOELECTRIC DETECTOR
CHEMICAL SENSOR ARRAY
B
2
TEMPERATURE DETECTOR
IONIZATION DETECTOR
PHOTOELECTRIC DETECTOR
CHEMICAL SENSOR ARRAY
C
1
TEMPERATURE DETECTOR
IONIZATION DETECTOR
PHOTOELECTRIC DETECTOR
CHEMICAL SENSOR ARRAY
CO & CO_2 SENSORS
VIDEO (VISIBLE, IR)
RESPIRATOR INDICATOR
STRESS/FORCE SENSOR
FIREFIGHTER LOCATION

FIG. 7


UL WOOD CRIB #1
5 pt avg, 50 pt delay
5 pt avg, 100 pt delay
5 pt avg, 200 pt delay
RESPONSE, ΔR/R (DIMENSIONLESS)
20
10
0
-10
-20 x10-3
0
200
400
600
800
TIME (SEC)

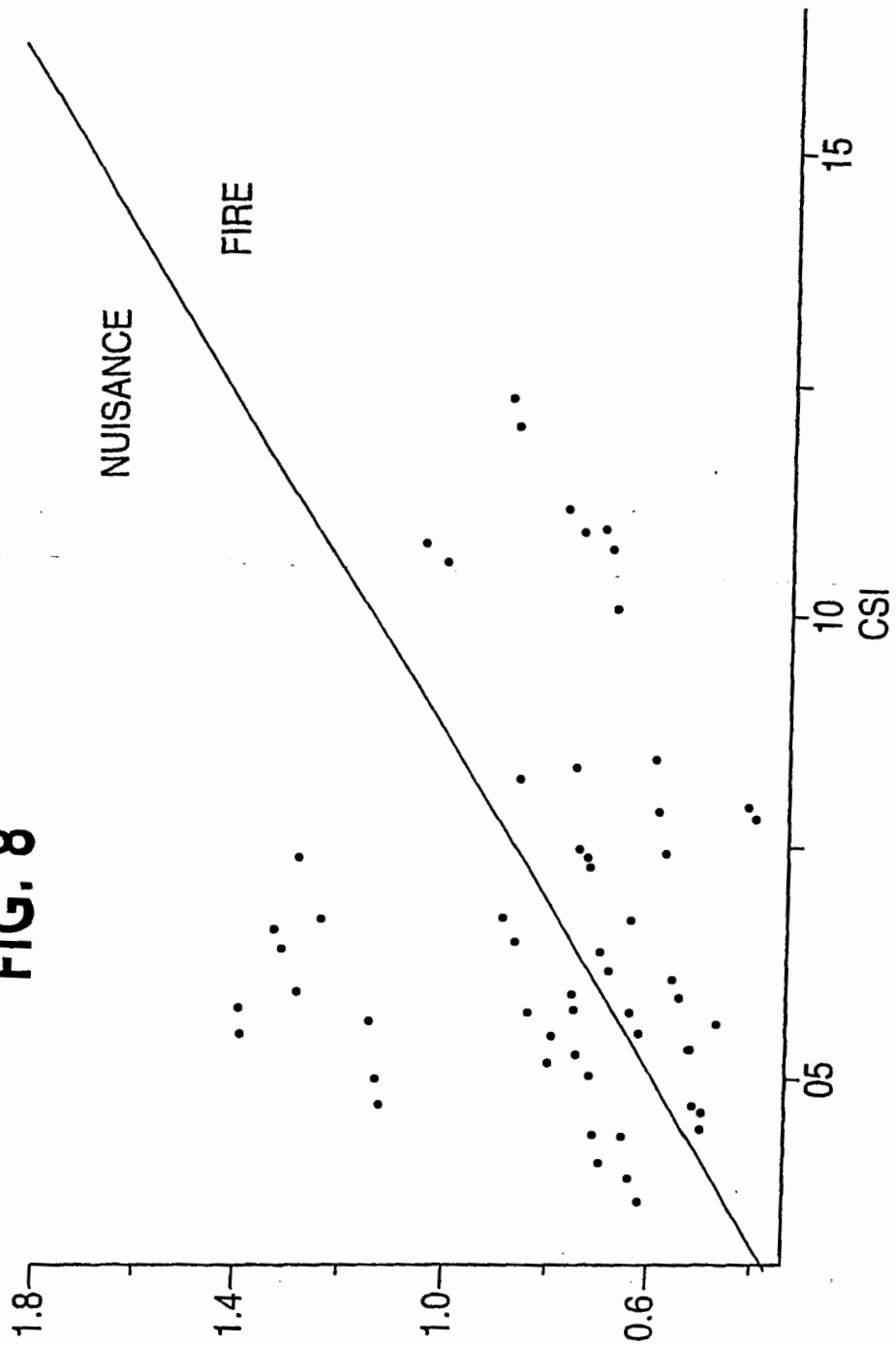


FIG. 8

FIG. 9

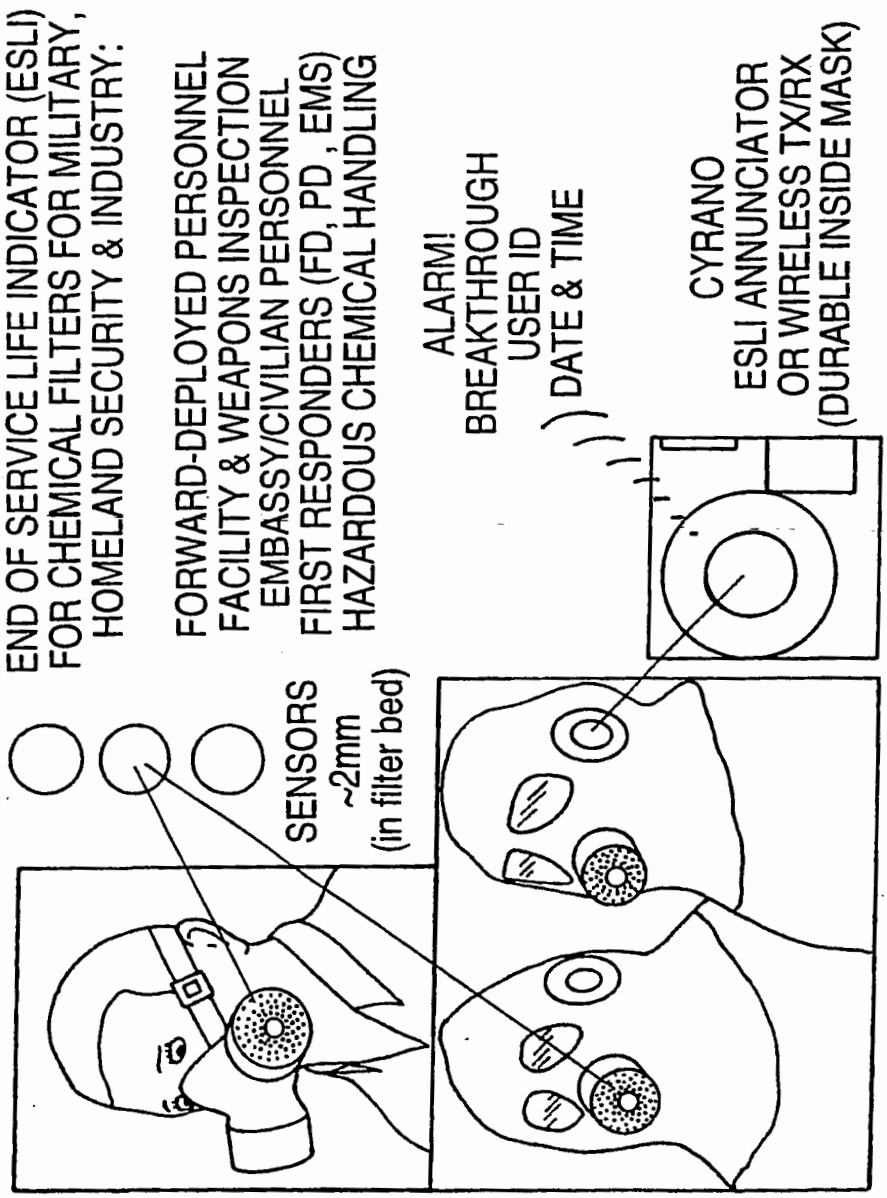

END OF SERVICE LIFE INDICATOR (ESLI)
FOR CHEMICAL FILTERS FOR MILITARY,
HOMELAND SECURITY & INDUSTRY:
FORWARD-DEPLOYED PERSONNEL
FACILITY & WEAPONS INSPECTION
EMBASSY/CIVILIAN PERSONNEL
FIRST RESPONDERS (FD, PD , EMS)
HAZARDOUS CHEMICAL HANDLING
SENSORS
~2mm
(in filter bed)
ALARM!
BREAKTHROUGH
USER ID
DATE & TIME
CYRANO
ESLI ANNUNCIATOR
OR WIRELESS TX/RX
(DURABLE INSIDE MASK)

FIG. 10

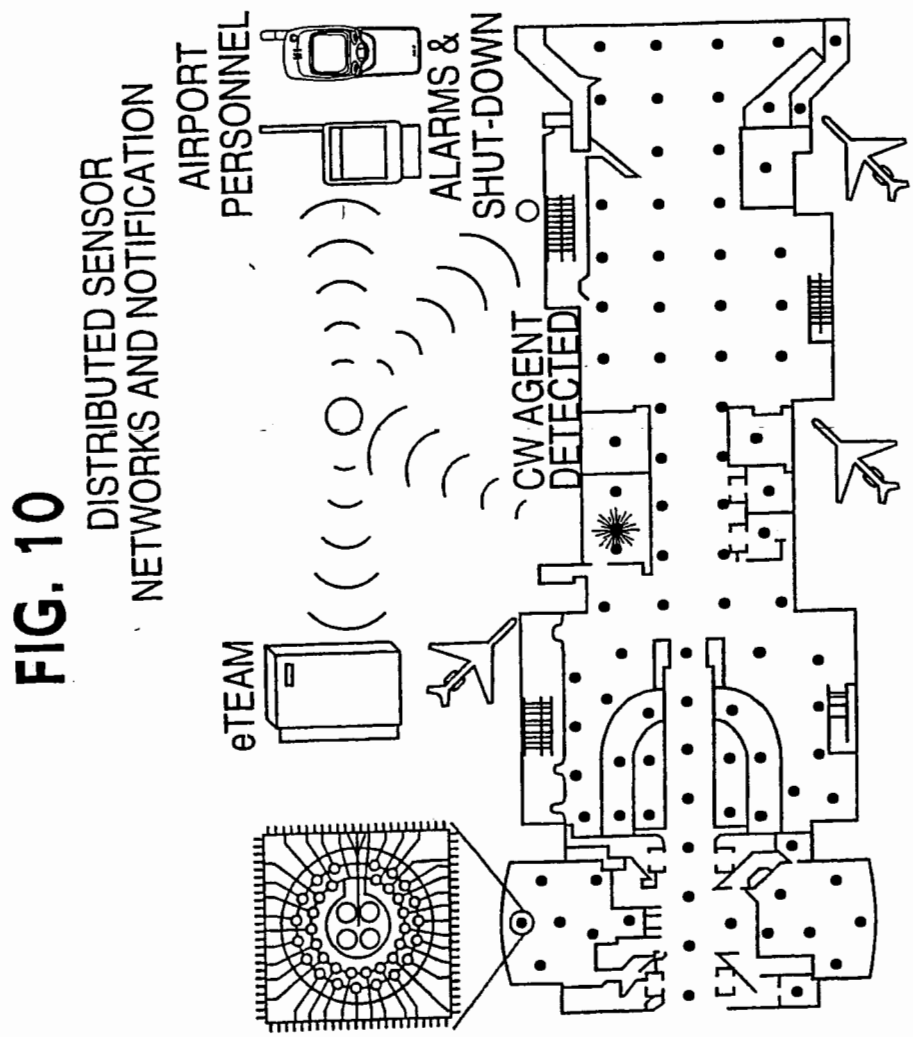

DISTRIBUTED SENSOR
NETWORKS AND NOTIFICATION
AIRPORT
PERSONNEL
ALARMS &
SHUT-DOWN
CW AGENT
DETECTED
eTEAM

FIG. 11

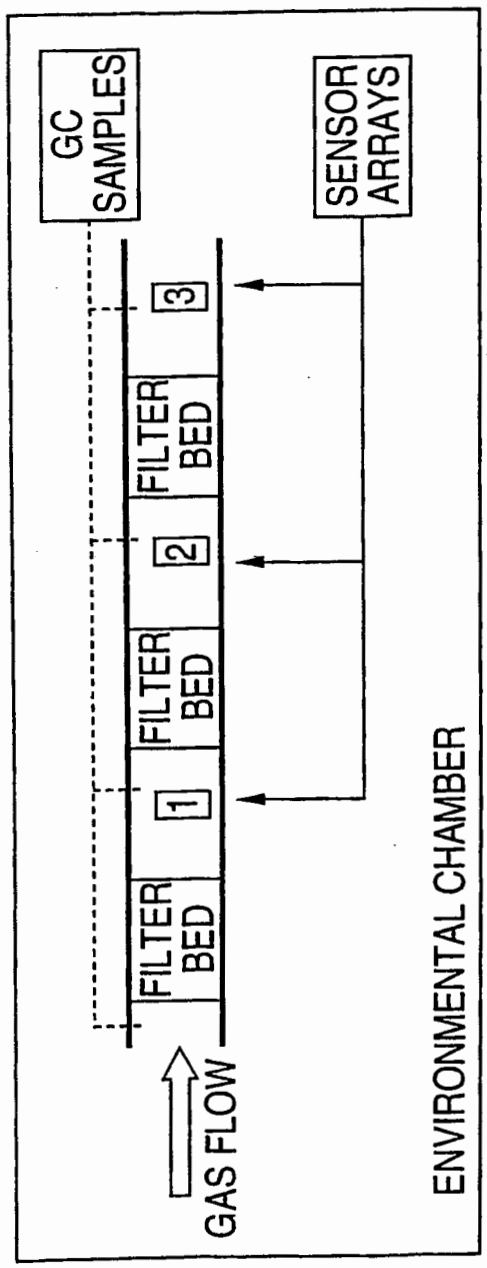

GC SAMPLES
SENSOR ARRAYS
FILTER BED
1
FILTER BED
2
FILTER BED
3
GAS FLOW
ENVIRONMENTAL CHAMBER

FIG. 12

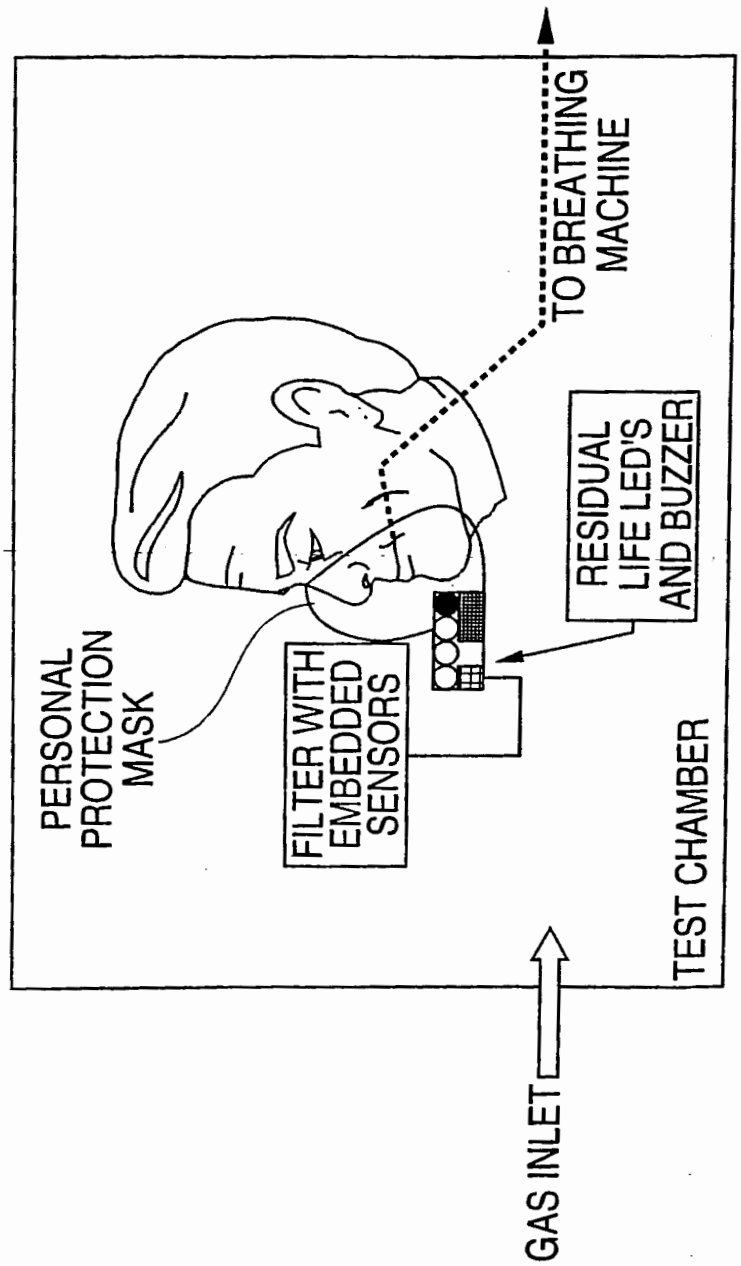
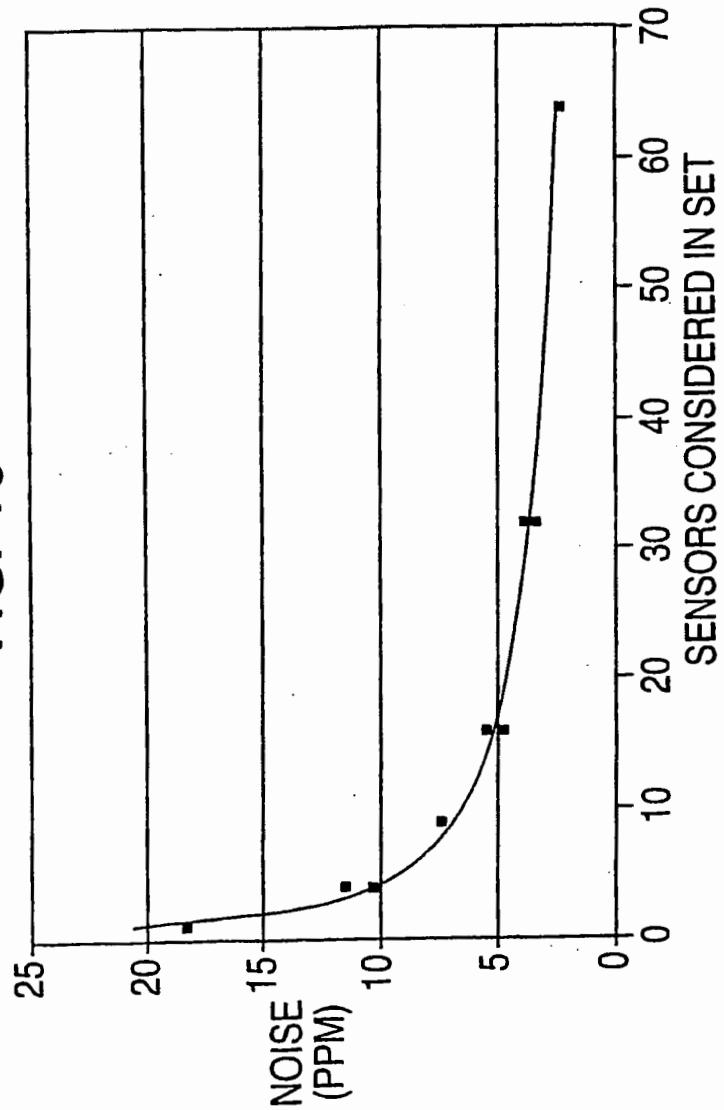

TO BREATHING MACHINE
RESIDUAL LIFE LED'S AND BUZZER
PERSONAL PROTECTION MASK
FILTER WITH EMBEDDED SENSORS
TEST CHAMBER
GAS INLET

FIG. 13


NOISE (PPM)
25
20
15
10
5
0
0
10
20
30
40
50
60
70
SENSORS CONSIDERED IN SET

18 JAN 2007

FIG. 14

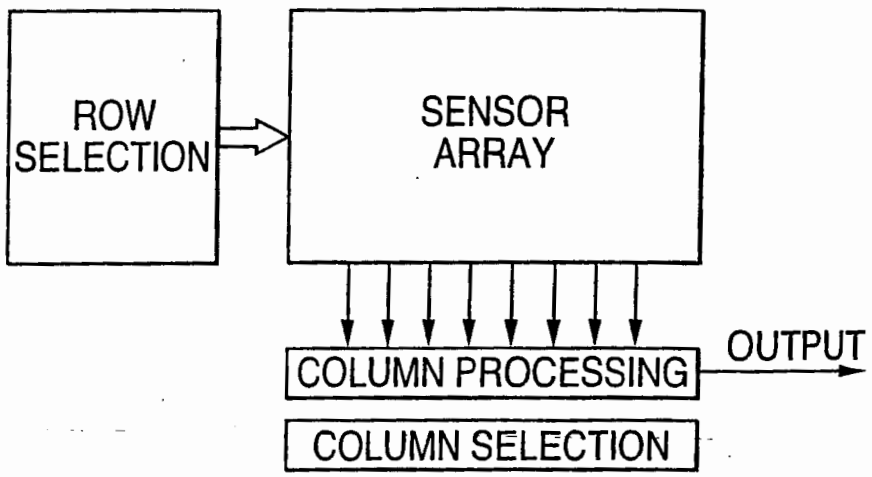
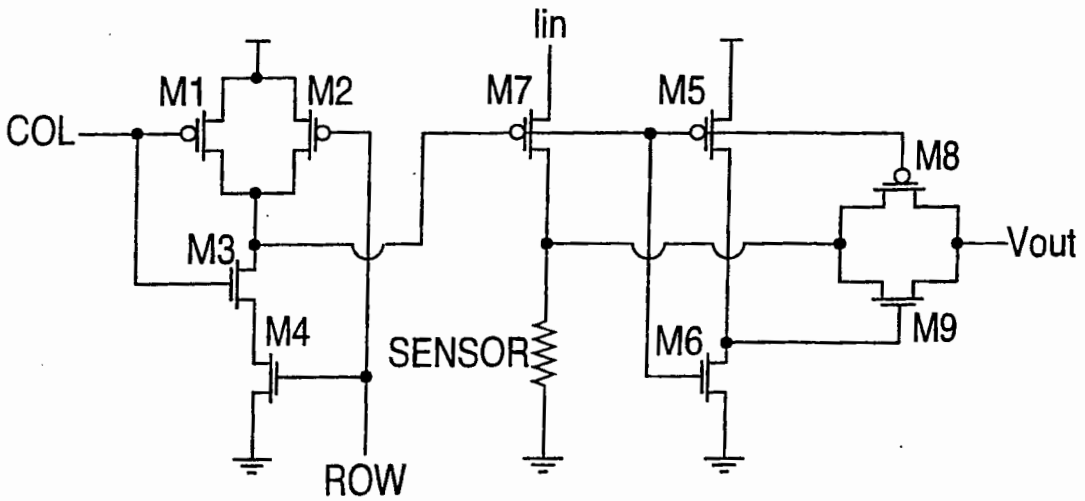


FIG. 15



18 JAN 2007

FIG. 16

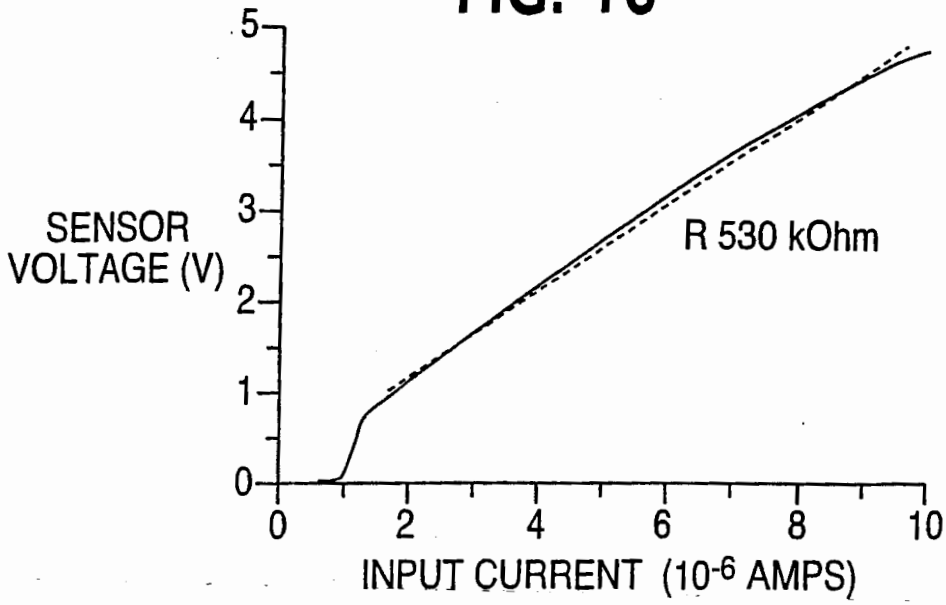


FIG. 17

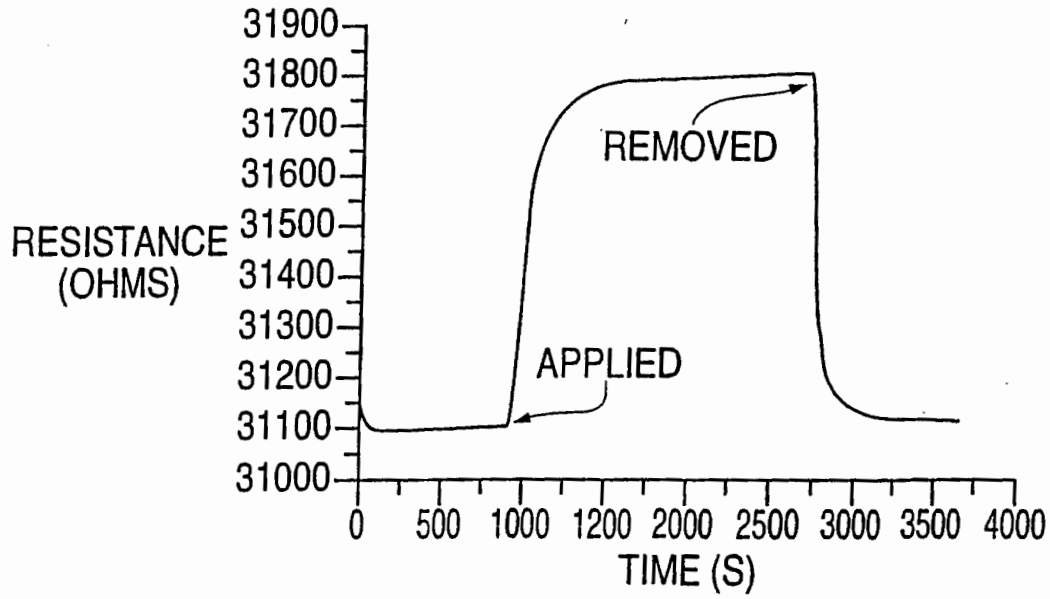


FIG. 18

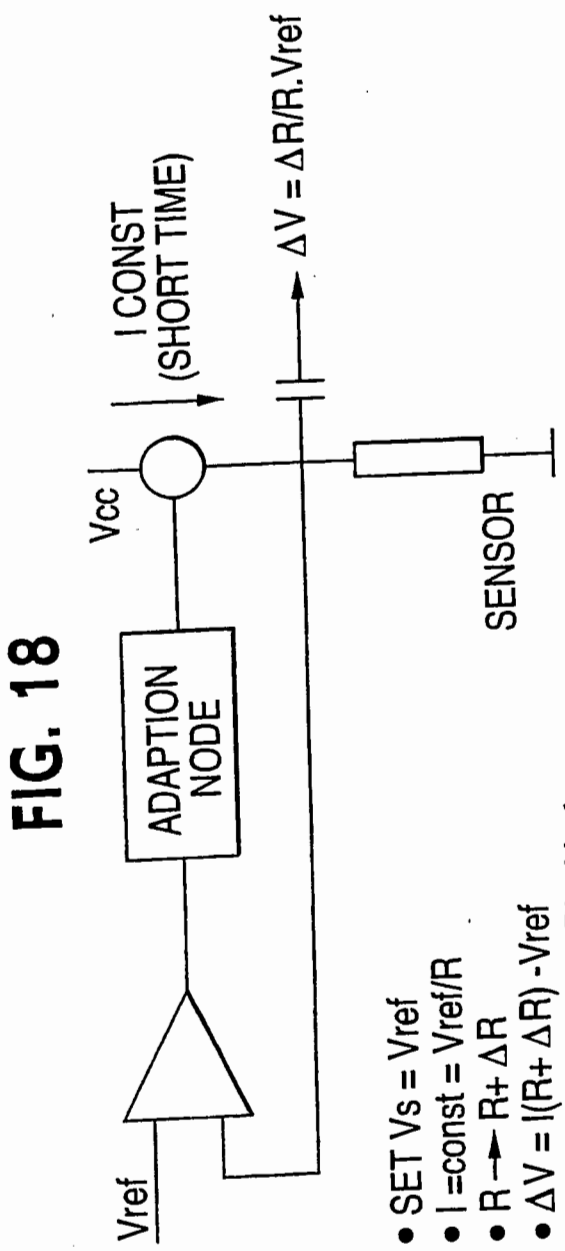

I CONST
(SHORT TIME)
ΔV = ΔR/R.Vref
Vcc
SENSOR
ADAPTION
NODE
Vref
• SET Vs = Vref
• I =const = Vref/R
• R → R+ ΔR
• ΔV = I(R+ ΔR) -Vref
• ΔV = Vref(1 + ΔR/R) - Vref
• ΔV + ΔR/R . Vref

FIG. 19

Sample #	Treatment	Solvents	Particle Size nm
6537-57b	Poly(isobutylene) on BP700	Isopar G	150
8847-9a	Polypropylene glycol on BP700	Xylene	180
6537-40	Poly(acrylic ester) on BP700	Ethanol	210
6537-51	Poly(acrylic acid) on BP700	water	210

FIG. 20a

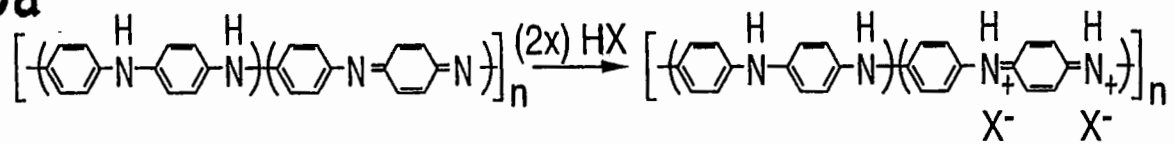


FIG. 20b

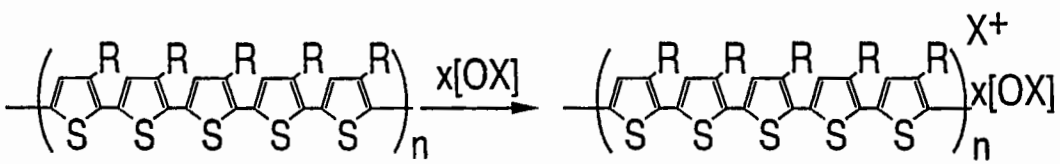


FIG. 21

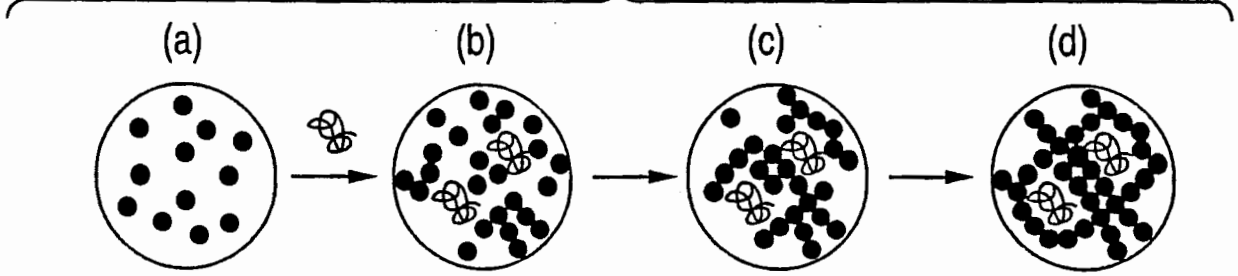
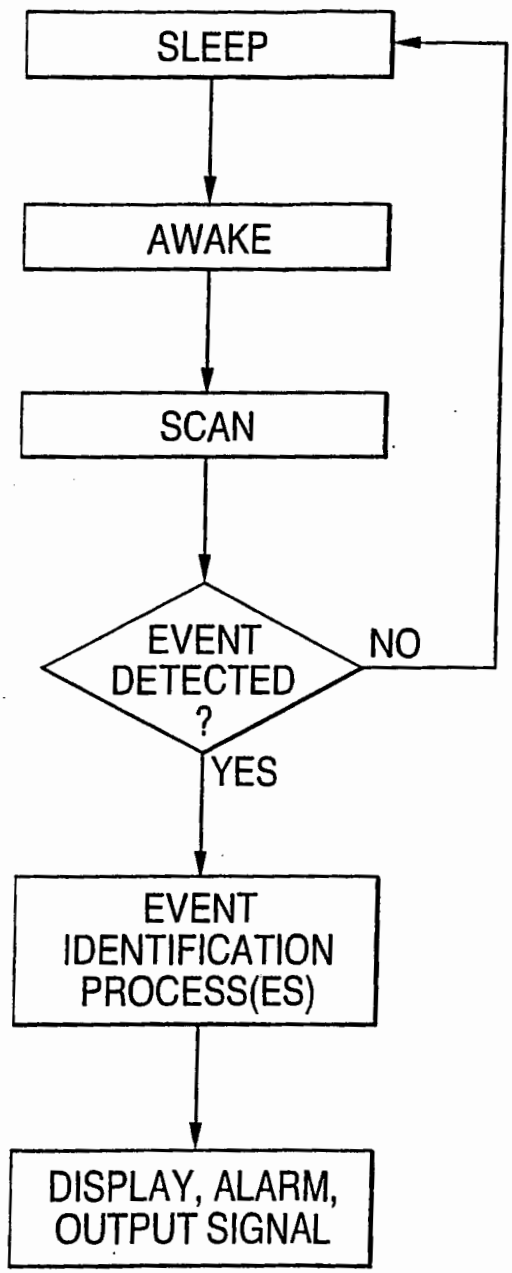


FIG. 22


SLEEP
AWAKE
SCAN
EVENT DETECTED ?
NO
YES
EVENT IDENTIFICATION PROCESS(ES)
DISPLAY, ALARM, OUTPUT SIGNAL

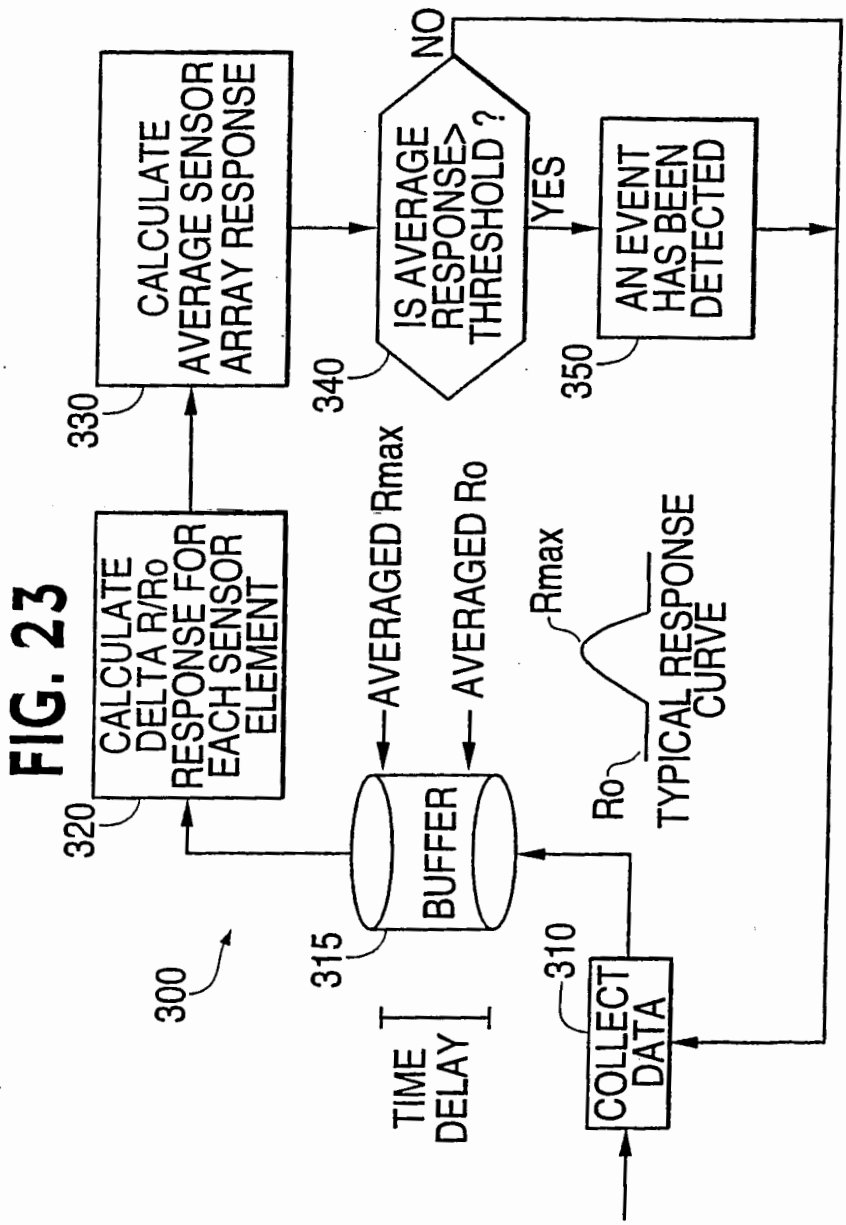
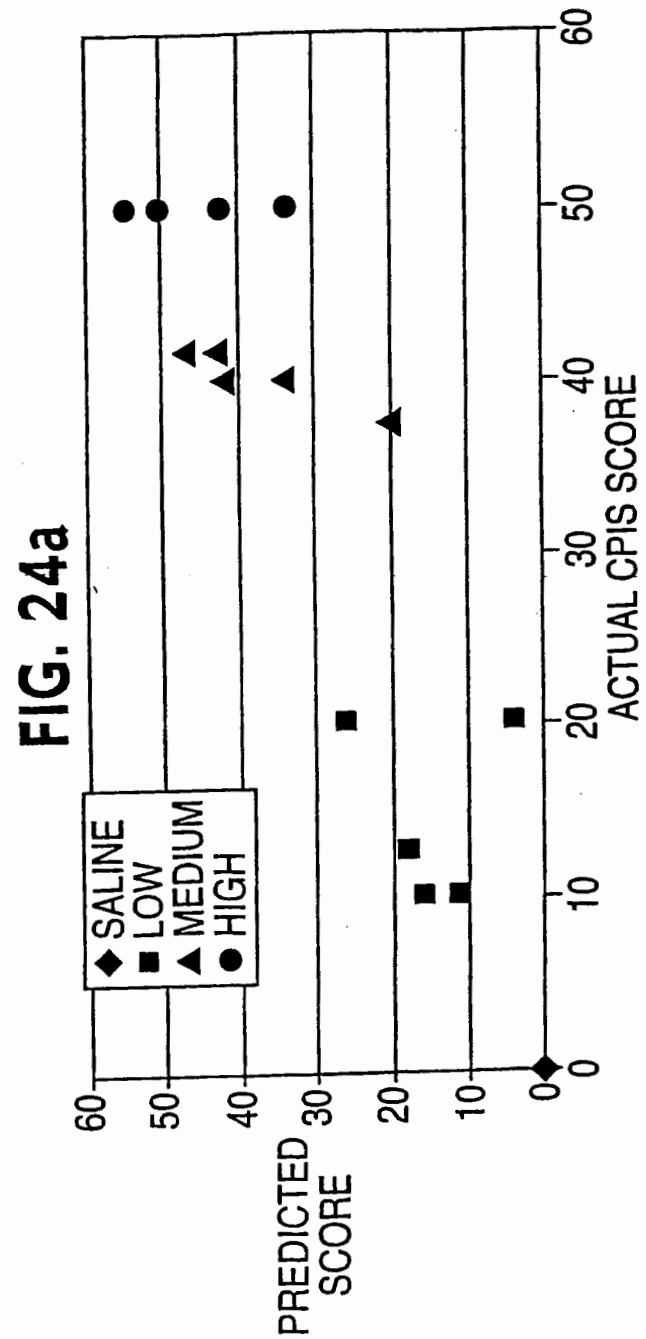

300
310
COLLECT DATA
315
BUFFER
320
CALCULATE DELTA R/Ro RESPONSE FOR EACH SENSOR ELEMENT
330
CALCULATE AVERAGE SENSOR ARRAY RESPONSE
340
IS AVERAGE RESPONSE> THRESHOLD ?
NO
YES
350
AN EVENT HAS BEEN DETECTED
AVERAGED Rmax
AVERAGED Ro
TIME DELAY
Rmax
Ro
TYPICAL RESPONSE CURVE

FIG. 23

FIG. 24a


SALINE
LOW
MEDIUM
HIGH
PREDICTED SCORE
ACTUAL CPIS SCORE
0
10
20
30
40
50
60

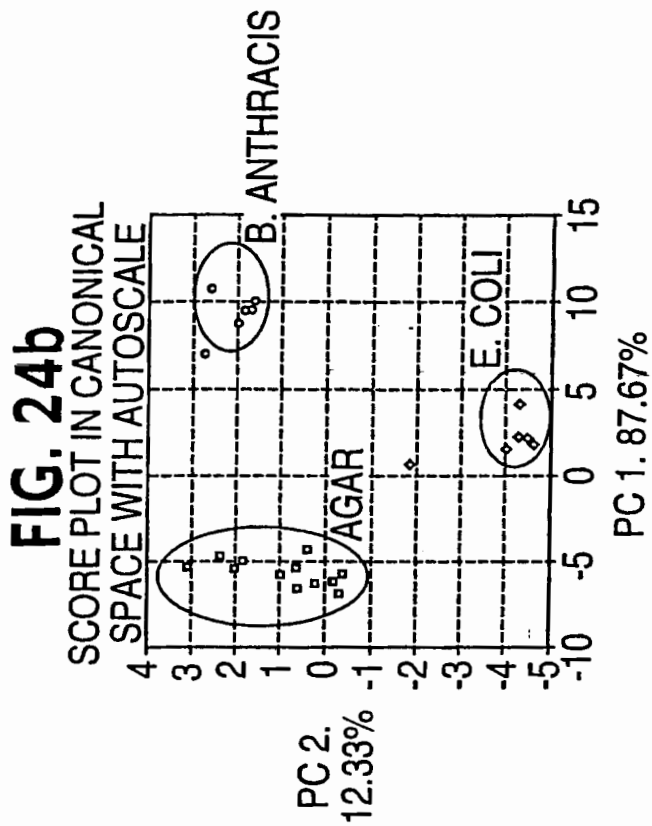


FIG. 24b
SCORE PLOT IN CANONICAL SPACE WITH AUTOSCALE