adding said SS balancing factor to all subsequent SS measurements made by said first tuner;

subtracting the N measurement of the calibration station made by the first tuner from the N measurement of the calibration station made by the second tuner to arrive at an N balancing factor; and

adding said N balancing factor to all subsequent N measurements made by said first tuner.

79. In a tuning system for a radio, a method of determining a Quality Factor QF of a channel comprising the steps of:

obtaining samples of N (noise) and AFT (automatic fine tuning);

taking the averages of said samples;

obtaining a reference value of AFT;

subtracting the AFT average from the reference value to obtain an AFT offset; and,

computing a QF as a factor of N, and AFT offset that is representative of the listenability of the received signal.

80. In the method for a tuning system as set forth in claim 79, wherein said step of QF computation includes the steps of:

taking the square root of N average times AFT offset; and

adding thereto the N range divided by two.

81. In a tuning system as set forth in claim 79, said method further including the steps of:

obtaining samples of signal strength (SS);

taking the average of said SS samples; and

including SS as a factor in the step of computing QF.

82. A method for identifying the listenability of channels in an FM receiver including a city/highway driving switch, a display, and a tuner, wherein SS (signal strength), N (noise) and AFT (automatic fine tuning) voltages are produced on respective capacitors, comprising the steps of:

determining whether said switch is in the city or in the highway position;

setting respective signal strength thresholds at higher values when said switch is in the highway position than when it is in the city position;

tuning the tuner to a channel in the band;

clamping the voltages across the capacitors to neutral values of voltage;

unclamping the capacitors;

obtaining a first group of samples of the voltage on each capacitor and calculating their respective averages;

rejecting a channel for the purpose of providing a reference value of AFT if the voltage average of SS samples are below a predetermined threshold value, or if the voltage average of N samples are greater than a given limit, or if the AFT voltage average is less than a given value;

tuning in the next channel and repeating the procedure if the channel is rejected;

obtaining second and third groups of samples of SS, N, and AFT;

accepting a channel for the purpose of providing a reference value of AFT, if the voltage averages of said second and third groups of SS samples are both greater than a predetermined threshold value, the voltage ranges of SS values of the samples in said second and third groups are within a given percentage of each other, the voltage averages of the samples of N for both groups are less than a given limit and the difference between the voltage averages of the AFT samples of both groups is less than a given voltage, which is less than said given value with which the first group of AFT samples is compared;

accepting the average of the combined averages of the second and third groups of AFT voltages as the AFT reference value;

tuning in the next channel and repeating the procedure of obtaining a first group of samples of SS, N, and AFT and calculating their voltage averages;

rejecting a channel as definitely not listenable, for which the average voltage of the SS samples is less than a given threshold, or the average of the N samples is greater than a given limit, or the average of the AFT samples are offset from the reference value of AFT by more than a predetermined amount;

tuning in the next channel and repeating the procedure if the channel is rejected;

obtaining second and third groups of samples of SS, N, and AFT;

calculating the voltage averages of each of the second and third group of samples of SS, N, and AFT, respectively;

determining the voltage ranges of the samples of SS in each of said second and third groups; and

analyzing the remaining channels to identify those that are very listenable;

analyzing the remaining channels to see if they are at least marginally listenable; and

forming a display at respective locations of the average signal strength of the listenable channels.

83. In a tuning system for a receiver in which channels of a band are identified as listenable or unlistenable by comparing the strength of the received signal with a threshold value and wherein a city/highway driving switch is provided, said tuning system comprising;

means for determining whether said switch is in the city or in the highway position;

means for setting signal strength thresholds at higher values when said switch is in the highway position than when it is in the city position;

means for momentarily charging a capacitor to a neutral value when the system operates to tune from a first channel to a second channel;

means for applying a voltage to said capacitor

corresponding to a characteristic of signals received in a channel;

an integration or filter circuit including said capacitor couple to said voltage;

means for obtaining samples of the voltage across the capacitor at such times that the effect of artifacts on the average value of said samples is reduced;

means for deriving said average value;

means for identifying if a channel is listenable by determining if a characteristic is acceptable by comparing the value of the sample or the average of multiple samples with the voltage that would be across the capacitor at the time of the samples if a voltage corresponding to a limit for the characteristic were applied to the integration or filter circuit;

means responsive to said signals for producing displays at respective locations of identified listenable stations in the band; and

means for tuning the radio receiver to a selected one of the displayed stations.

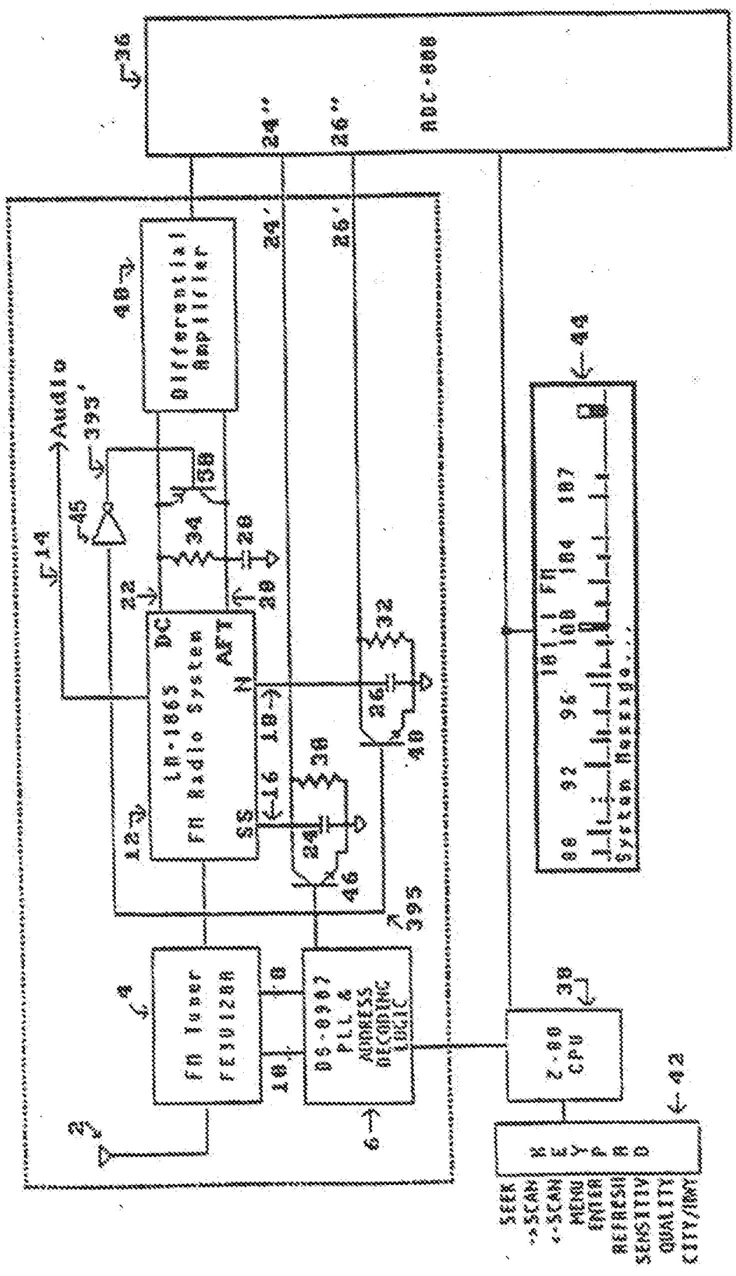

ADC-808
Differential Amplifier
Audio
LA-1865
FM Radio System
DC
AFT
SS
FM Tuner
DS-8907
PLL &
ADDRESS
DECODING
LOGIC
Z-80
CPU
KEYPAD
SEEK
->SCAN
<-SCAN
MENU
ENTER
REFRESH
SENSITIV
QUALITY
88 92 96 100 104 107
FM
System Message...

Fig 1

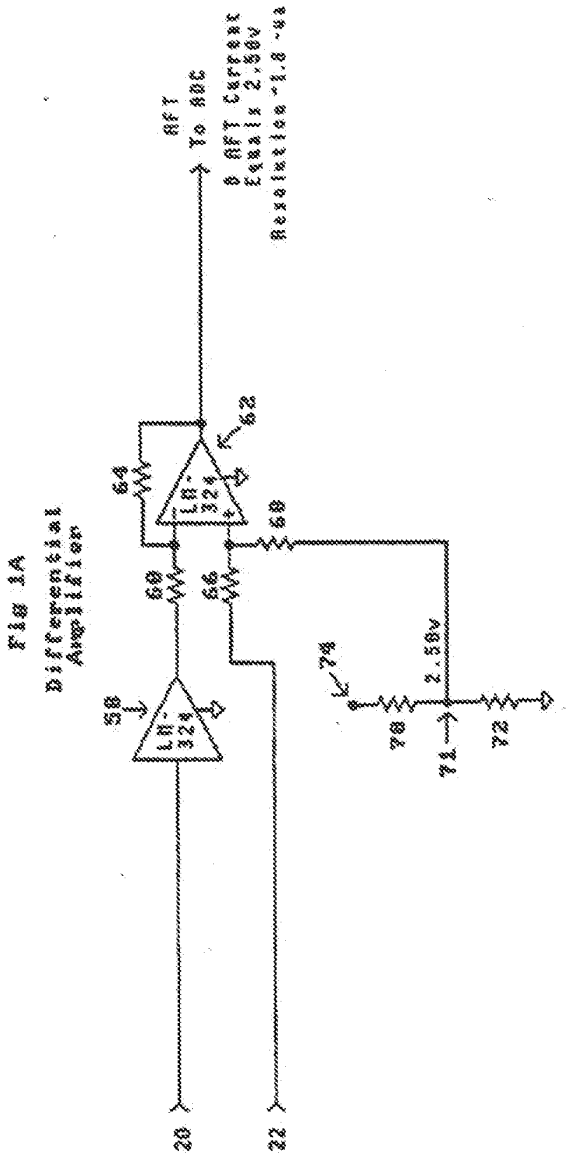


Fig 1A
Differential
Amplifier

Fig. 2

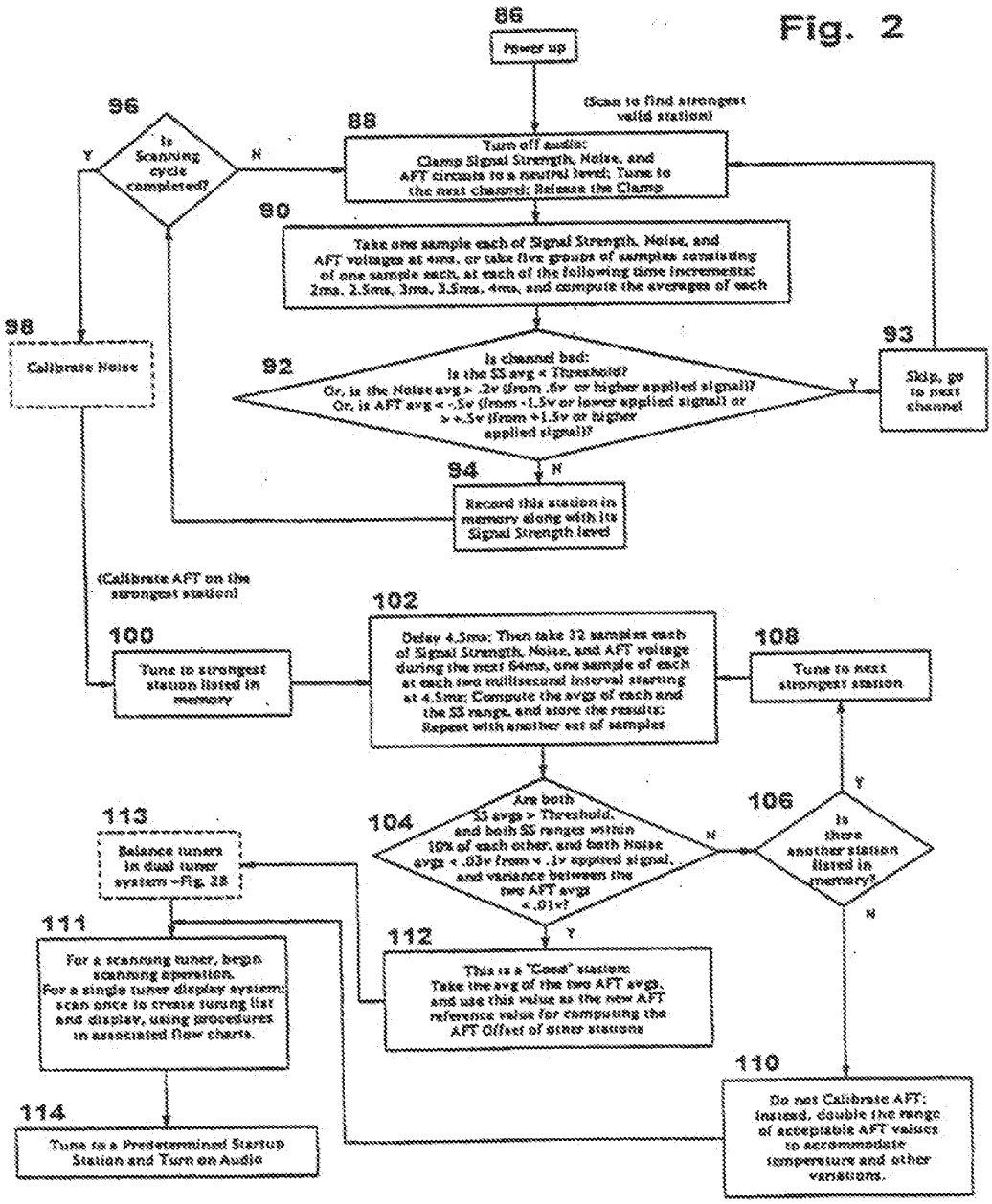
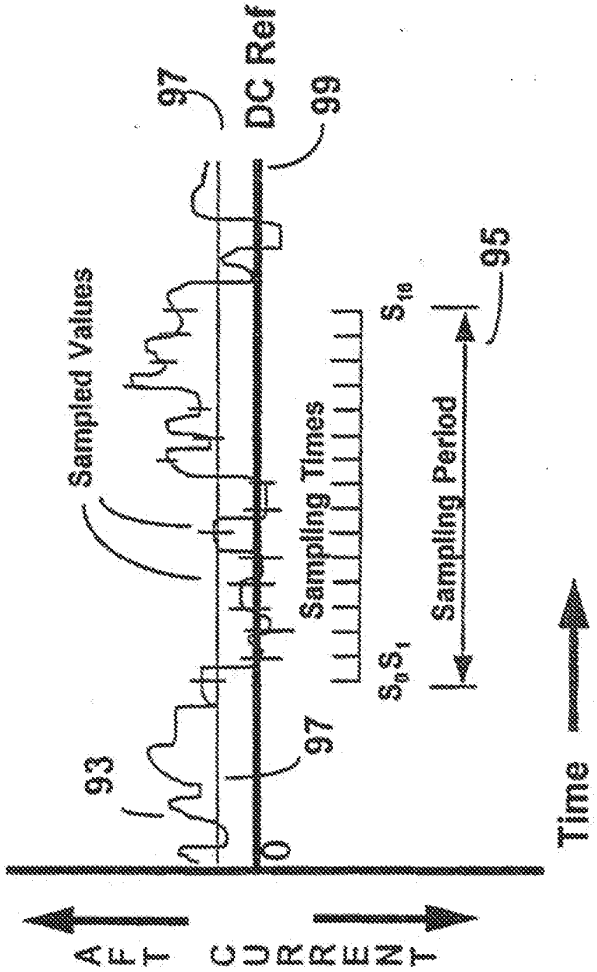

86
Power up
(Scan to find strongest valid station)
96
Is Scanning cycle completed?
Y
N
88
Turn off audio; Clamp Signal Strength, Noise, and AFT circuits to a neutral level; Tune to the next channel; Release the Clamp
90
Take one sample each of Signal Strength, Noise, and AFT voltages at 4ms, or take five groups of samples consisting of one sample each, at each of the following time increments: 2ms, 2.5ms, 3ms, 3.5ms, 4ms, and compute the averages of each
98
Calibrate Noise
92
Is channel bad: Is the SS avg < Threshold? Or, is the Noise avg > .2v (from .8v or higher applied signal)? Or, is AFT avg < -.5v (from -1.5v or lower applied signal or > +.5v (from +1.5v or higher applied signal)?
Y
93
Skip, go to next channel
N
94
Record this station in memory along with its Signal Strength level
(Calibrate AFT on the strongest station)
100
Tune to strongest station listed in memory
102
Delay 4.5ms; Then take 32 samples each of Signal Strength, Noise, and AFT voltage during the next 64ms, one sample of each at each two millisecond interval starting at 4.5ms; Compute the avgs of each and the SS range, and store the results; Repeat with another set of samples
108
Tune to next strongest station
Y
106
Is there another station listed in memory?
N
104
Are both SS avgs > Threshold, and both SS ranges within 10% of each other, and both Noise avgs < .03v from < .1v applied signal, and variance between the two AFT avgs < .01v?
N
Y
113
Balance tuners in dual tuner system -Fig. 28
111
For a scanning tuner, begin scanning operation. For a single tuner display system, scan once to create tuning list and display, using procedures in associated flow charts.
112
This is a "Good" station: Take the avg of the two AFT avgs, and use this value as the new AFT reference value for computing the AFT Offset of other stations
110
Do not Calibrate AFT; Instead, double the range of acceptable AFT values to accommodate temperature and other variations.
114
Tune to a Predetermined Startup Station and Turn on Audio

Fig. 2A


97
DC Ref
99
Sampled Values
95
S_{10}
Sampling Times
Sampling Period
$S_0 S_1$
93
97
0
Time
AFT
CURRENT

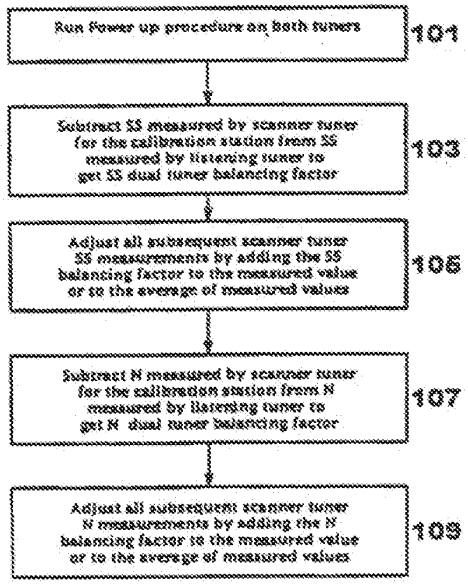

Run Power up procedure on both tuners
101
Subtract SS measured by scanner tuner for the calibration station from SS measured by listening tuner to get SS dual tuner balancing factor
103
Adjust all subsequent scanner tuner SS measurements by adding the SS balancing factor to the measured value or to the average of measured values
105
Subtract N measured by scanner tuner for the calibration station from N measured by listening tuner to get N dual tuner balancing factor
107
Adjust all subsequent scanner tuner N measurements by adding the N balancing factor to the measured value or to the average of measured values
109

Fig. 2B

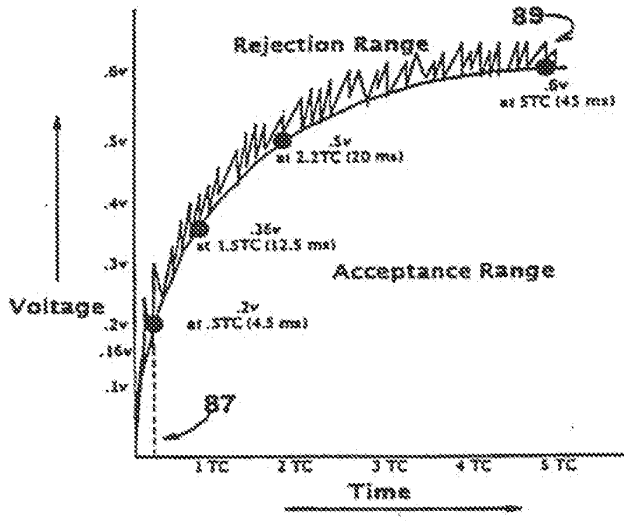

89
Rejection Range
.6v
at 5TC (45 ms)
.5v
at 2.2TC (20 ms)
.4v
.35v
at 1.5TC (12.5 ms)
.3v
Acceptance Range
Voltage
.2v
at .5TC (4.5 ms)
.16v
.1v
87
1 TC
2 TC
3 TC
4 TC
5 TC
Time

Fig. 3

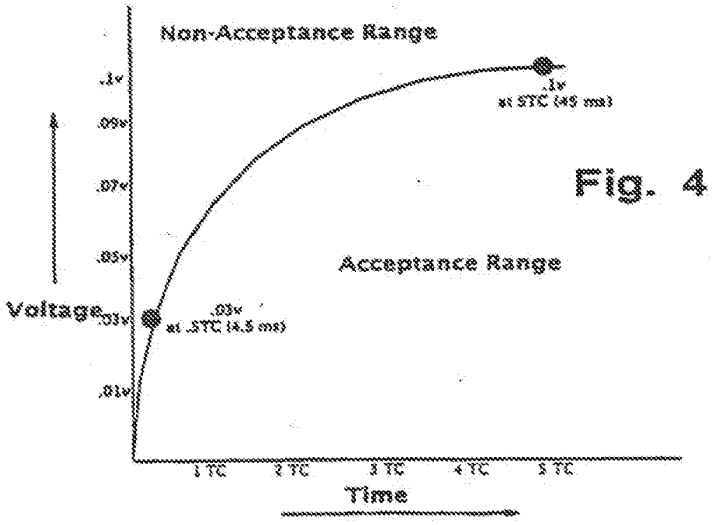

Non-Acceptance Range
.1v
.09v
at 5TC (45 ms)
.07v
.05v
Acceptance Range
Voltage
.03v
at .5TC (4.5 ms)
.01v
1 TC
2 TC
3 TC
4 TC
5 TC
Time

Fig. 4

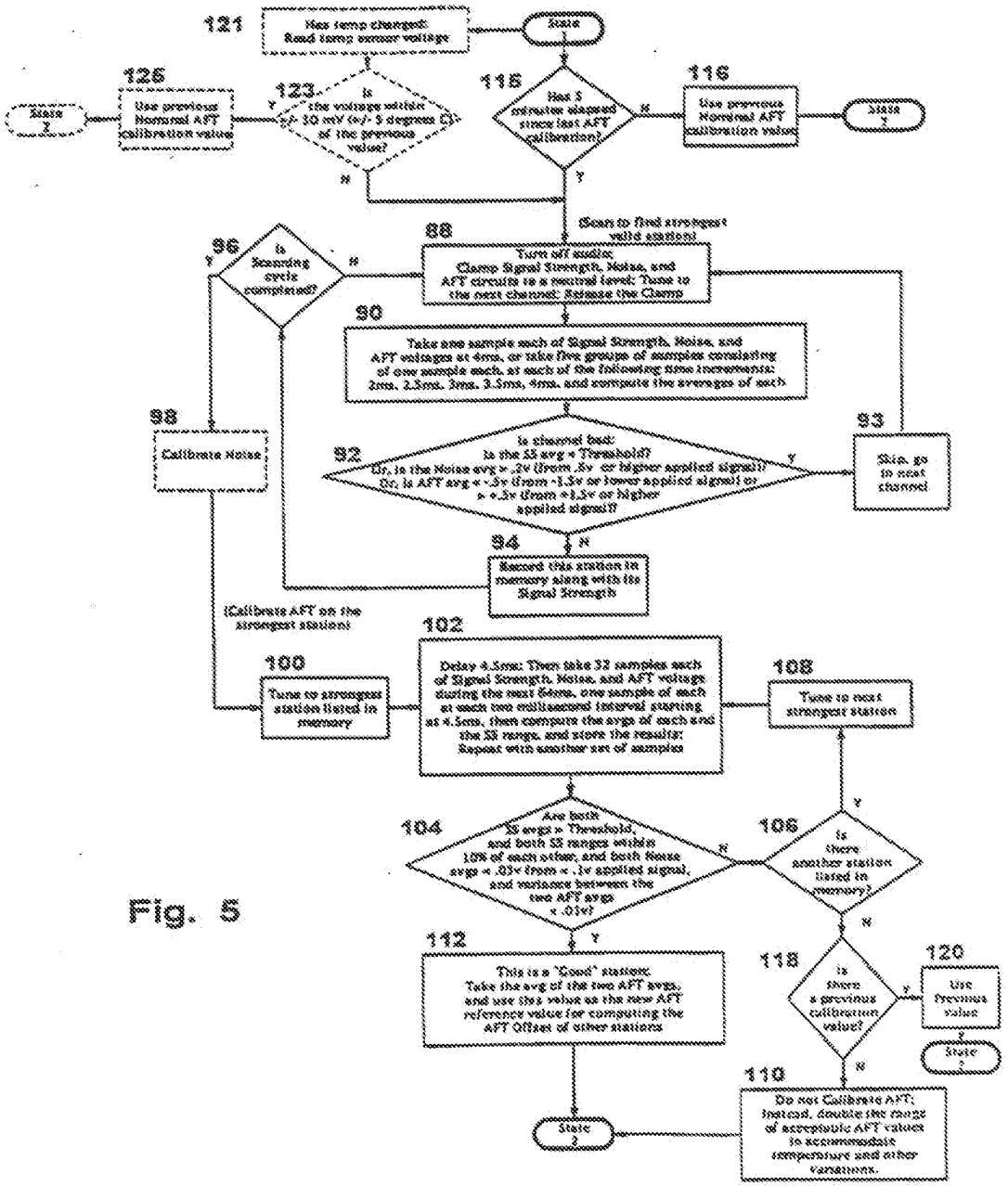

121
Has temp changed? Read temp sensor voltage
State 1
126
State 2
Use previous Nominal AFT calibration value
123
Is the voltage within +/- 30 mV (+/- 5 degrees C) of the previous value?
Y
N
116
Has 5 minutes elapsed since last AFT calibration?
N
Use previous Nominal AFT calibration value
State 1
Y
(Scan to find strongest valid station)
96
Is Scanning cycle completed?
Y
N
88
Turn off audio; Clamp Signal Strength, Noise, and AFT circuits to a neutral level; Tune to the next channel; Release the Clamp
90
Take one sample each of Signal Strength, Noise, and AFT voltages at 4ms, or take five groups of samples consisting of one sample each, at each of the following time increments: 2ms, 2.5ms, 3ms, 3.5ms, 4ms, and compute the averages of each
98
Calibrate Noise
92
Is channel bad: Is the SS avg < Threshold? Or, is the Noise avg > .2v (from .5v or higher applied signal)? Or, is AFT avg < -.5v (from -1.5v or lower applied signal) or > +.5v (from +1.5v or higher applied signal)?
Y
93
Skip, go to next channel
N
94
Record this station in memory along with its Signal Strength
(Calibrate AFT on the strongest station)
100
Tune to strongest station listed in memory
102
Delay 4.5ms; Then take 32 samples each of Signal Strength, Noise, and AFT voltage during the next 64ms, one sample of each at each two millisecond interval starting at 4.5ms, then compute the avgs of each and the SS range, and store the results; Repeat with another set of samples
108
Tune to next strongest station
104
Are both SS avgs > Threshold, and both SS ranges within 10% of each other, and both Noise avgs < .03v (from < .1v applied signal, and variance between the two AFT avgs < .01v?
N
Y
106
Is there another station listed in memory?
Y
N
112
This is a "Good" station; Take the avg of the two AFT avgs, and use this value as the new AFT reference value for computing the AFT Offset of other stations
118
Is there a previous calibration value?
Y
120
Use Previous value
State 2
N
110
Do not Calibrate AFT; Instead, double the range of acceptable AFT values to accommodate temperature and other variations.
State 2

Fig. 5

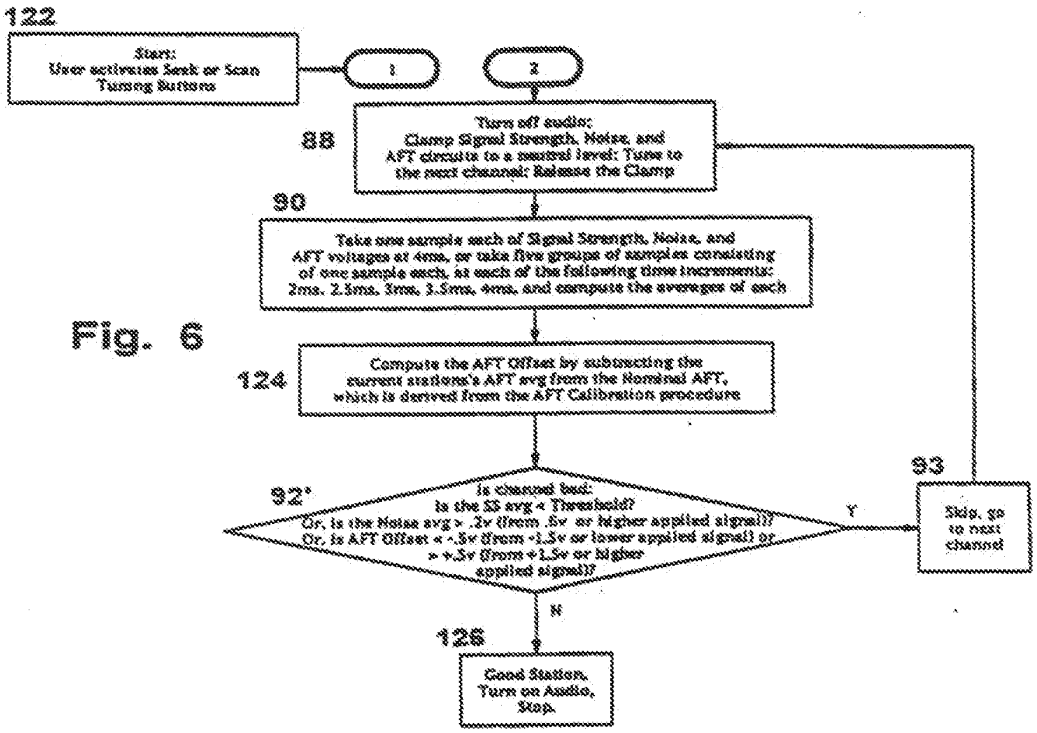

122
Start:
User activates Seek or Scan
Tuning Buttons
1
2
88
Turn off audio;
Clamp Signal Strength, Noise, and
AFT circuits to a neutral level; Tune to
the next channel; Release the Clamp
90
Take one sample each of Signal Strength, Noise, and
AFT voltages at 4ms, or take five groups of samples consisting
of one sample each, at each of the following time increments:
2ms, 2.5ms, 3ms, 3.5ms, 4ms, and compute the averages of each
124
Compute the AFT Offset by subtracting the
current stations's AFT avg from the Nominal AFT,
which is derived from the AFT Calibration procedure
92'
Is channel bad:
Is the SS avg < Threshold?
Or, is the Noise avg > .2v (from .8v or higher applied signal)?
Or, is AFT Offset < -.5v (from +1.5v or lower applied signal) or
> +.5v (from +2.5v or higher
applied signal)?
Y
93
Skip, go
to next
channel
N
126
Good Station,
Turn on Audio,
Stop.

Fig. 6

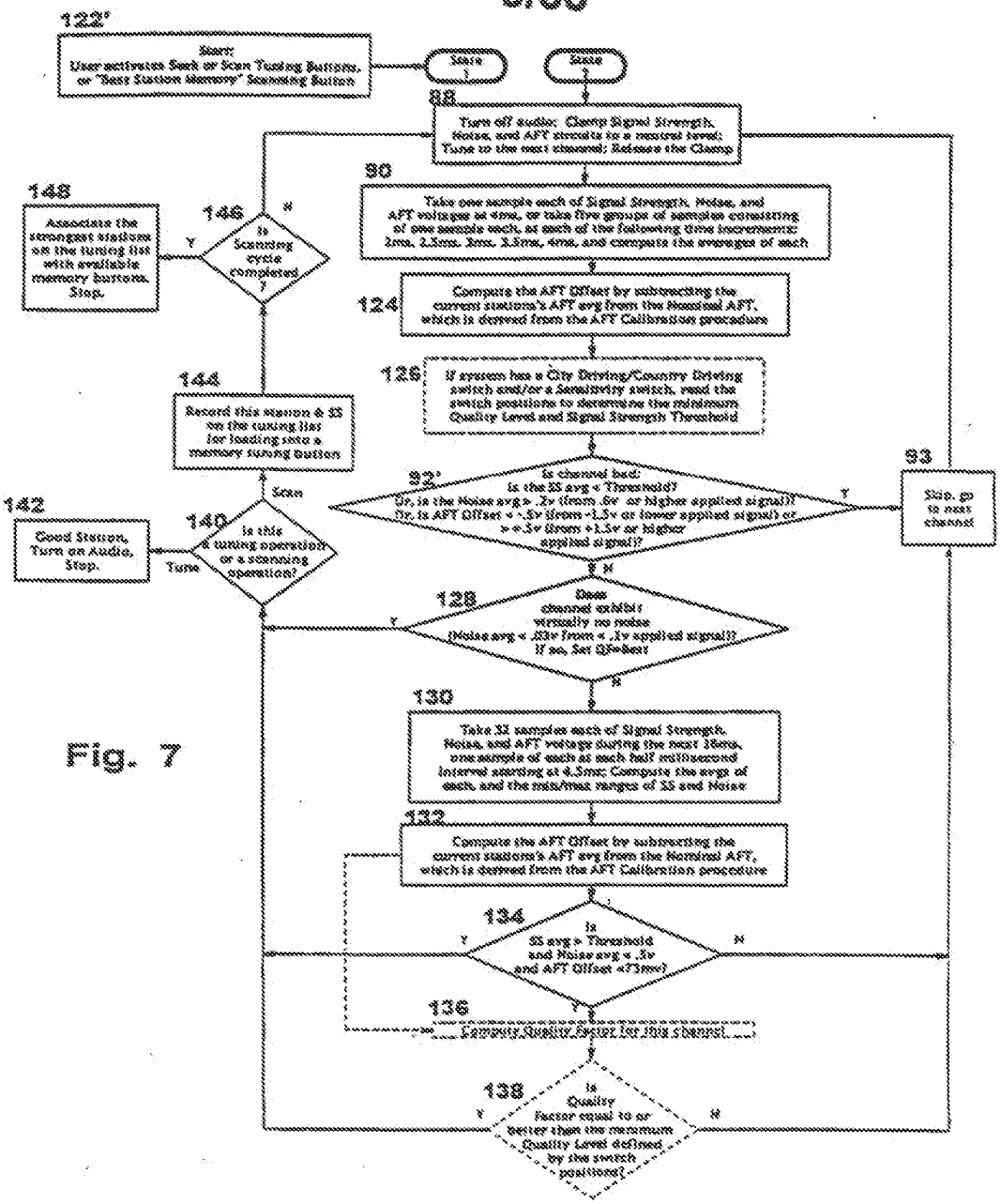

122'
Start:
User activates Seek or Scan Tuning Buttons, or "Best Station Memory" Scanning Button
State 1
State 2
88
Turn off audio; Clamp Signal Strength, Noise, and AFT circuits to a neutral level; Tune to the next channel; Release the Clamp
90
Take one sample each of Signal Strength, Noise, and AFT voltages at 4ms, or take five groups of samples consisting of one sample each, at each of the following time increments: 1ms, 2.5ms, 3ms, 3.5ms, 4ms, and compute the averages of each
124
Compute the AFT Offset by subtracting the current stations's AFT avg from the Nominal AFT, which is derived from the AFT Calibration procedure
126
If system has a City Driving/Country Driving switch and/or a Sensitivity switch, read the switch positions to determine the minimum Quality Level and Signal Strength Threshold
93'
Is channel bad:
Is the SS avg < Threshold?
Or, is the Noise avg > .2v (from .6v or higher applied signal)?
Or, is AFT Offset < -.5v (from -1.5v or lower applied signal) or > +.5v (from +1.5v or higher applied signal)?
Y
N
93
Skip, go to next channel
128
Does channel exhibit virtually no noise (Noise avg < .03v from < .1v applied signal)?
If so, Set Quieter
Y
N
130
Take 32 samples each of Signal Strength, Noise, and AFT voltage during the next 16ms, one sample of each at each half millisecond interval starting at 4.5ms; Compute the avgs of each, and the min/max ranges of SS and Noise
132
Compute the AFT Offset by subtracting the current stations's AFT avg from the Nominal AFT, which is derived from the AFT Calibration procedure
134
Is SS avg > Threshold and Noise avg < .5v and AFT Offset <73mv)
Y
N
136
Compute Quality Factor for this channel
138
Is Quality Factor equal to or better than the minimum Quality Level defined by the switch positions?
Y
N
146
Is Scanning cycle completed?
Y
N
148
Associate the strongest stations on the tuning list with available memory buttons, Stop.
144
Record this station & SS on the tuning list for loading into a memory tuning button
Scan
140
Is this a tuning operation or a scanning operation?
Tune
142
Good Station, Turn on Audio, Stop.

Fig. 7

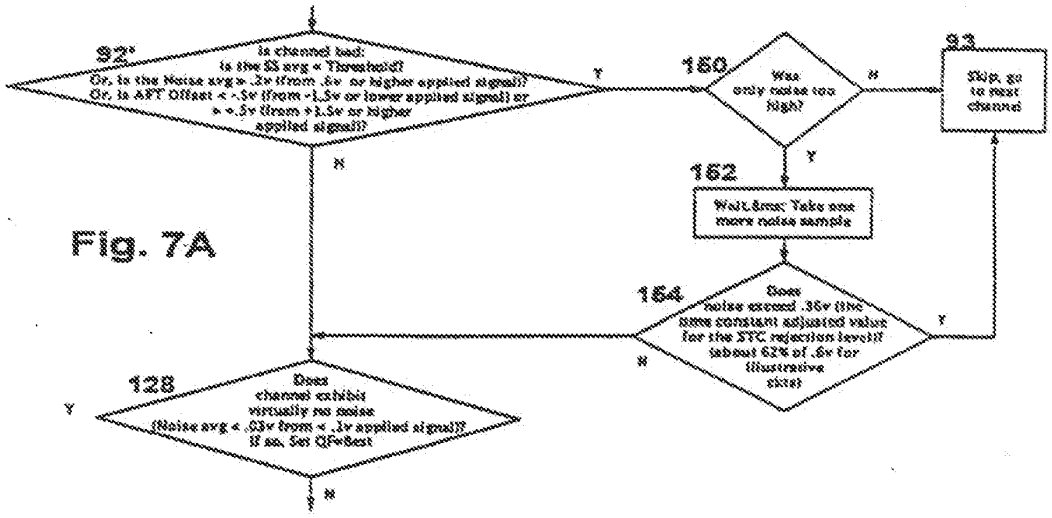

92'
Is channel bad:
Is the SS avg < Threshold?
Or, is the Noise avg > .3v (from .6v or higher applied signal)?
Or, is AFT Offset < -.5v (from -1.5v or lower applied signal) or
> +.5v (from +1.5v or higher
applied signal)?
Y
N
160
Was only noise too high?
N
Y
93
Skip, go to next channel
162
Wait 8msec Take one more noise sample
164
Does noise exceed .36v (the time constant adjusted value for the STC rejection level? (about 62% of .6v for illustrative skirt)
Y
N
128
Does channel exhibit virtually no noise (Noise avg < .03v from < .1v applied signal)? If so, Set QPvBest
Y
N

Fig. 7A

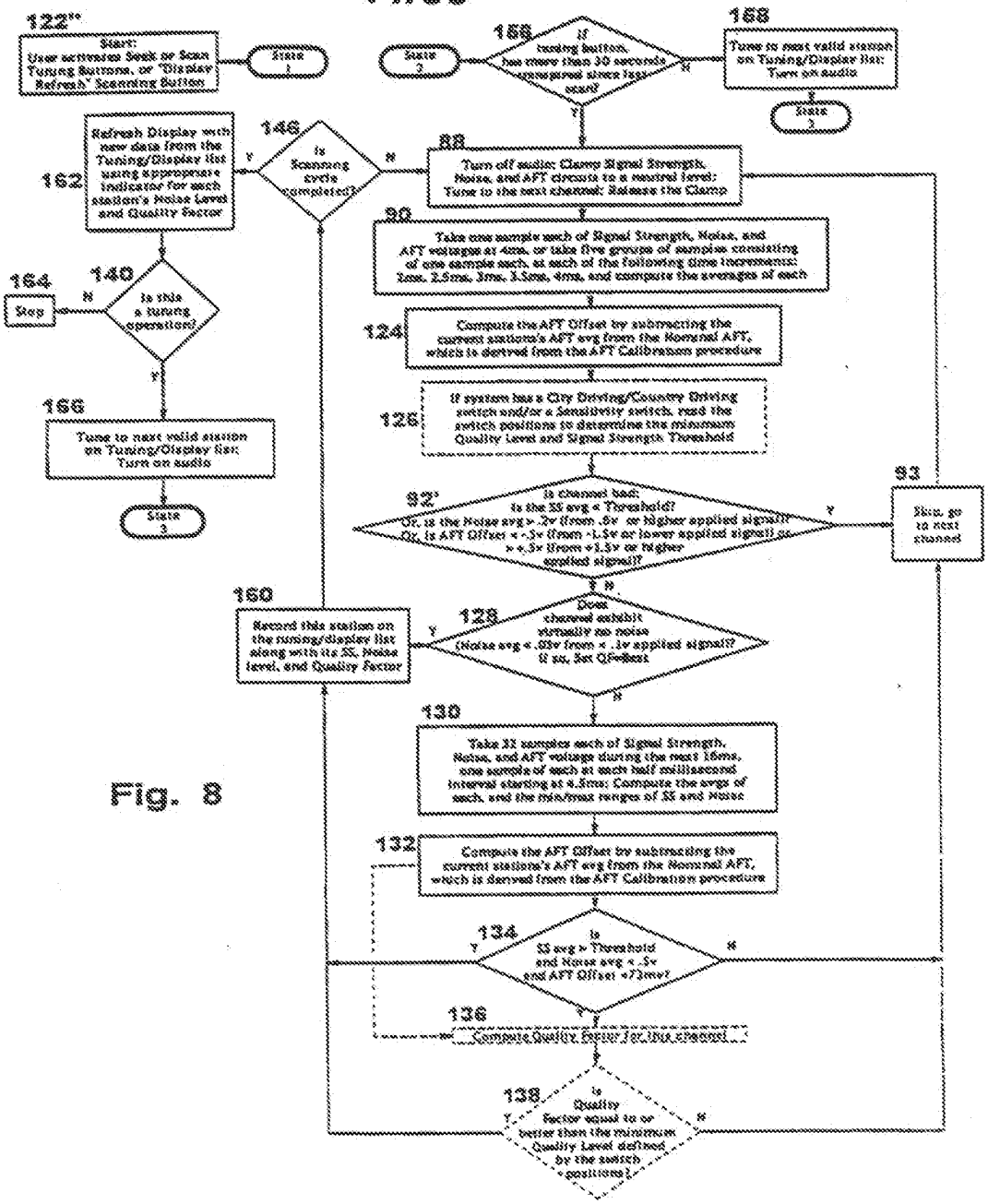
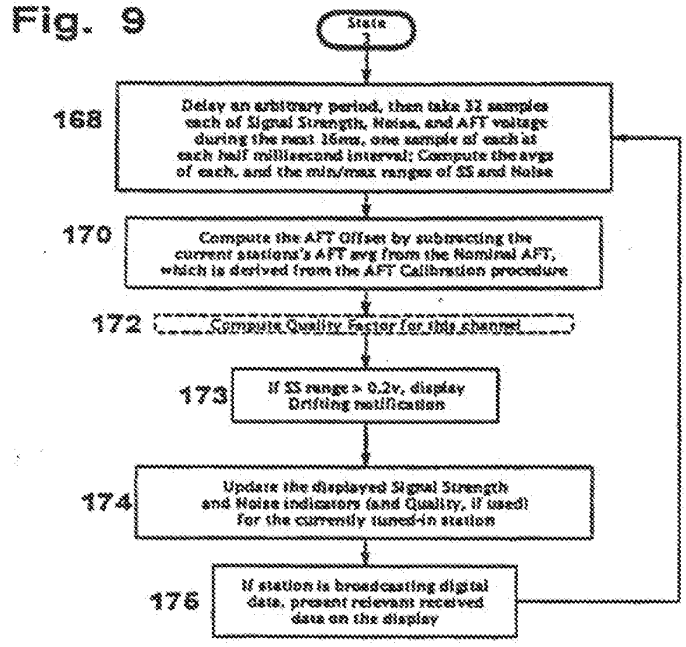

122"
Start: User activates Seek or Scan Tuning Buttons, or "Display Refresh" Scanning Button
State 1
State 2
158
If tuning button has been more than 30 seconds unexplored since last scan?
168
Tune to next valid station on Tuning/Display list: Turn on audio
State 3
162
Refresh Display with new data from the Tuning/Display list using appropriate indicator for each station's Noise Level and Quality Factor
146
Is Scanning cycle completed?
88
Turn off audio; Clamp Signal Strength, Noise, and AFT circuits to a neutral level; Tune to the next channel; Release the Clamp
90
Take one sample each of Signal Strength, Noise, and AFT voltages at 4ms, or take five groups of samples consisting of one sample each, at each of the following time increments: 1ms, 2.5ms, 3ms, 3.5ms, 4ms, and compute the averages of each
124
Compute the AFT Offset by subtracting the current station's AFT avg from the Nominal AFT, which is derived from the AFT Calibration procedure
126
If system has a City Driving/Country Driving switch and/or a Sensitivity switch, read the switch positions to determine the minimum Quality Level and Signal Strength Threshold
164
Step
140
Is this a tuning operation?
166
Tune to next valid station on Tuning/Display list: Turn on audio
State 3
92'
Is channel bad: Is the SS avg < Threshold? Or, is the Noise avg > .2v (from .6v or higher applied signal)? Or, is AFT Offset < -.5v (from -1.5v or lower applied signal) or > +.5v (from +1.5v or higher applied signal)?
93
Store, go to next channel
160
Record this station on the running/display list along with its SS, Noise level, and Quality Factor
128
Does channel exhibit virtually no noise (Noise avg < .05v from < .1v applied signal)? If so, Set QF=Best
130
Take 32 samples each of Signal Strength, Noise, and AFT voltage during the next 16ms, one sample of each at each half millisecond interval starting at 4.5ms; Compute the avgs of each, and the min/max ranges of SS and Noise
132
Compute the AFT Offset by subtracting the current station's AFT avg from the Nominal AFT, which is derived from the AFT Calibration procedure
134
Is SS avg > Threshold and Noise avg < .5v and AFT Offset <73mv?
136
Compute Quality Factor for this channel
138
Is Quality Factor equal to or better than the minimum Quality Level defined by the switch positions?

Fig. 8

Fig. 9


Start
168
Delay an arbitrary period, then take 32 samples each of Signal Strength, Noise, and AFT voltage during the next 15ms, one sample of each at each half millisecond interval; Compute the avgs of each, and the min/max ranges of SS and Noise
170
Compute the AFT Offset by subtracting the current station's AFT avg from the Nominal AFT, which is derived from the AFT Calibration procedure
172
Compute Quality Factor for this channel
173
If SS range > 0.2v, display Drifting notification
174
Update the displayed Signal Strength and Noise indicators (and Quality, if used) for the currently tuned-in station
176
If station is broadcasting digital data, present relevant received data on the display

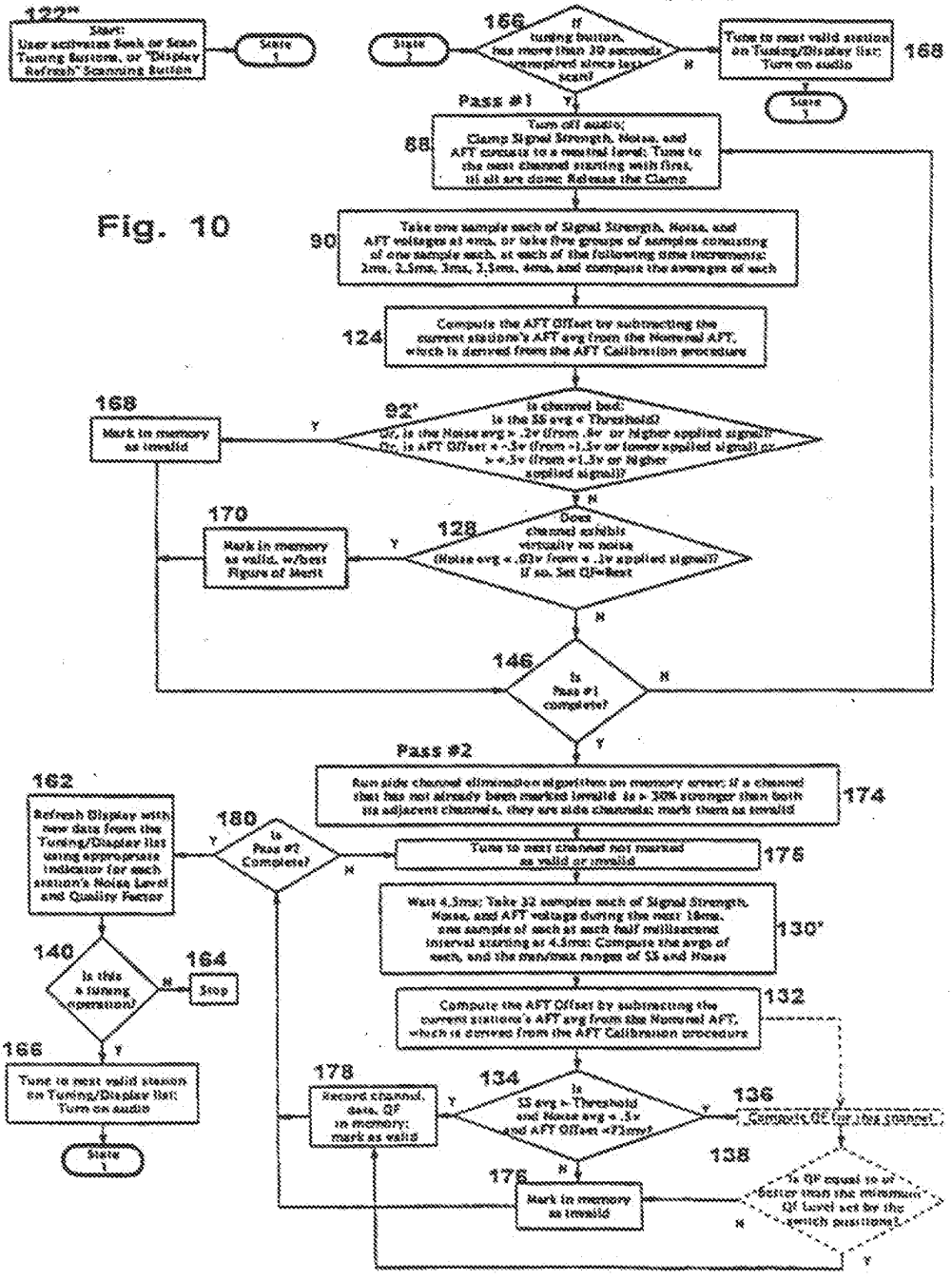

122"
Start:
User activates Seek or Scan Tuning Buttons, or "Display Refresh" Scanning Button
State 1
State 2
166
If tuning button, has more than 30 seconds elapsed since last scan?
Y
N
Tune to next valid station on Tuning/Display list; Turn on audio
168
State 1
Pass #1
88
Turn off audio; Clamp Signal Strength, Noise, and AFT circuits to a neutral level; Tune to the next channel starting with first, til all are done; Release the Clamp
90
Take one sample each of Signal Strength, Noise, and AFT voltages at once, or take five groups of samples consisting of one sample each, at each of the following time increments: 2ms, 2.5ms, 3ms, 3.5ms, 4ms, and compute the averages of each
124
Compute the AFT Offset by subtracting the current stations's AFT avg from the Nominal AFT, which is derived from the AFT Calibration procedure
168
Mark in memory as invalid
92'
Is channel bad: Is the SS avg < Threshold? Or, is the Noise avg > .2v (from .6v or higher applied signal)? Or, is AFT Offset < -.3v (from +1.3v or lower applied signal) or > +.3v (from +1.3v or higher applied signal)?
Y
N
170
Mark in memory as valid, w/Best Figure of Merit
128
Does channel exhibit virtually no noise (Noise avg < .03v from a .3v applied signal)? If so, Set QF=Best
Y
N
146
Is Pass #1 complete?
N
Y
Pass #2
174
Run side channel elimination algorithm on memory areas; if a channel that has not already been marked invalid is > 30% stronger than both its adjacent channels, they are side channels; mark them as invalid
162
Refresh Display with new data from the Tuning/Display list using appropriate indicator for each station's Noise Level and Quality Factor
180
Is Pass #2 Complete?
Y
N
176
Tune to next channel not marked as valid or invalid
130'
Wait 4.5ms; Take 32 samples each of Signal Strength, Noise, and AFT voltage during the next 16ms, one sample of each at each half millisecond interval starting at 4.5ms; Compute the avgs of each, and the min/max ranges of SS and Noise
132
Compute the AFT Offset by subtracting the current stations's AFT avg from the Nominal AFT, which is derived from the AFT Calibration procedure
140
Is this a tuning operation?
N
164
Stop
Y
166
Tune to next valid station on Tuning/Display list; Turn on audio
State 1
178
Record channel data, QF in memory; mark as valid
134
Is SS avg > Threshold and Noise avg < .3v and AFT Offset <Fixed?
Y
N
136
Compute QF for this channel
138
Is QF equal to or better than the minimum QF level set by the switch positions?
N
Y
178
Mark in memory as invalid

Fig. 10

Fig. 11

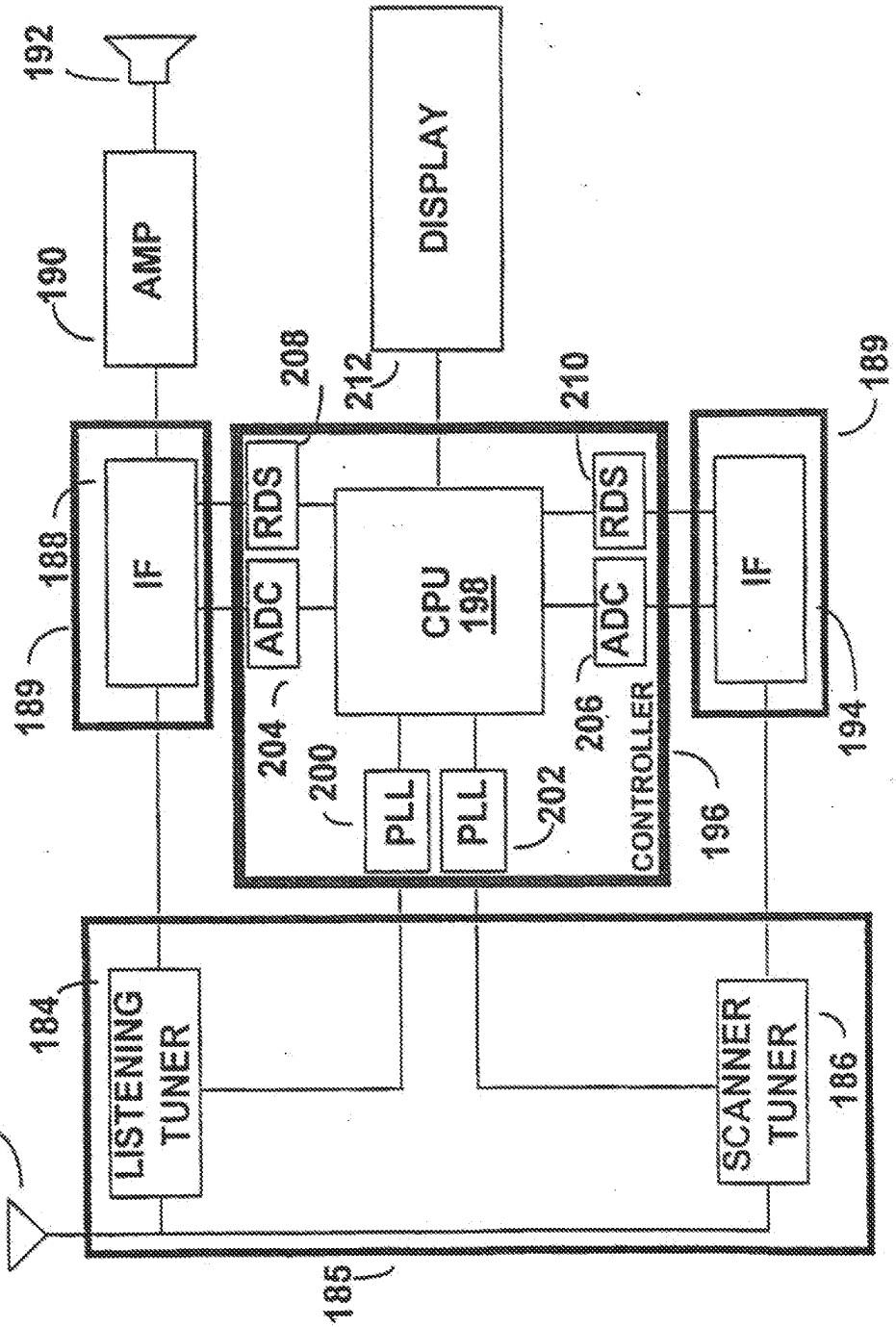

192
AMP
190
DISPLAY
208
212
210
189
188
IF
RDS
ADC
CPU
198
RDS
ADC
IF
189
204
200
PLL
PLL
202
206
CONTROLLER
196
194
184
LISTENING
TUNER
SCANNER
TUNER
186
182
185

Fig. 12

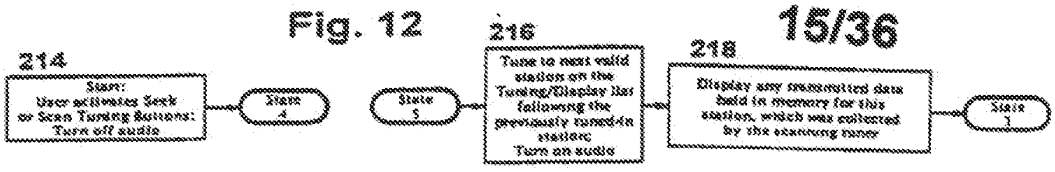

214
Start:
User activates Seek or Scan Tuning Buttons;
Turn off audio
State 4
State 5
216
Tune to next valid station on the Tuning/Display list following the previously tuned-in station;
Turn on audio
218
Display any transmitted data held in memory for this station, which was collected by the scanning tuner
State 1

Fig. 13

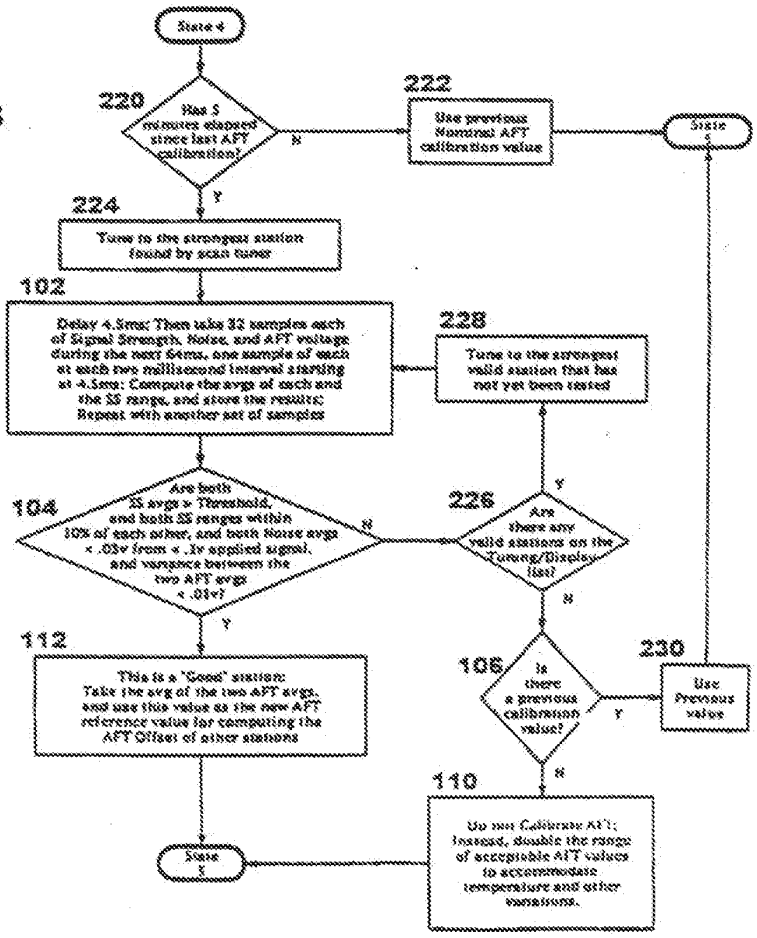
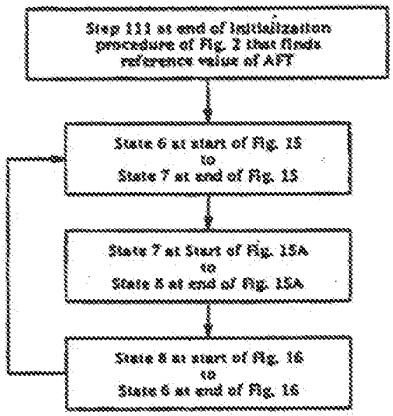

State 4
220
Has 5 minutes elapsed since last AFT calibration?
N
222
Use previous Nominal AFT calibration value
State 1
Y
224
Tune to the strongest station found by scan tuner
102
Delay 4.5ms; Then take 32 samples each of Signal Strength, Noise, and AFT voltage during the next 64ms, one sample of each at each two millisecond interval starting at 4.5ms; Compute the avgs of each and the 32 range, and store the results; Repeat with another set of samples
228
Tune to the strongest valid station that has not yet been tested
104
Are both 32 avgs > Threshold, and both 32 ranges within 10% of each other, and both Noise avgs < .03v from < .1v applied signal, and variance between the two AFT avgs < .01v?
N
226
Are there any valid stations on the Tuning/Display list?
Y
N
112
This is a "Good" station; Take the avg of the two AFT avgs, and use this value as the new AFT reference value for computing the AFT Offset of other stations
106
Is there a previous calibration value?
Y
230
Use Previous value
N
110
Do not Calibrate AFT; Instead, double the range of acceptable AFT values to accommodate temperature and other variations.
State 1

Fig. 14


Step 111 at end of initialization procedure of Fig. 2 that finds reference value of AFT
State 6 at start of Fig. 15 to State 7 at end of Fig. 15
State 7 at Start of Fig. 15A to State 8 at end of Fig. 15A
State 8 at start of Fig. 16 to State 6 at end of Fig. 16

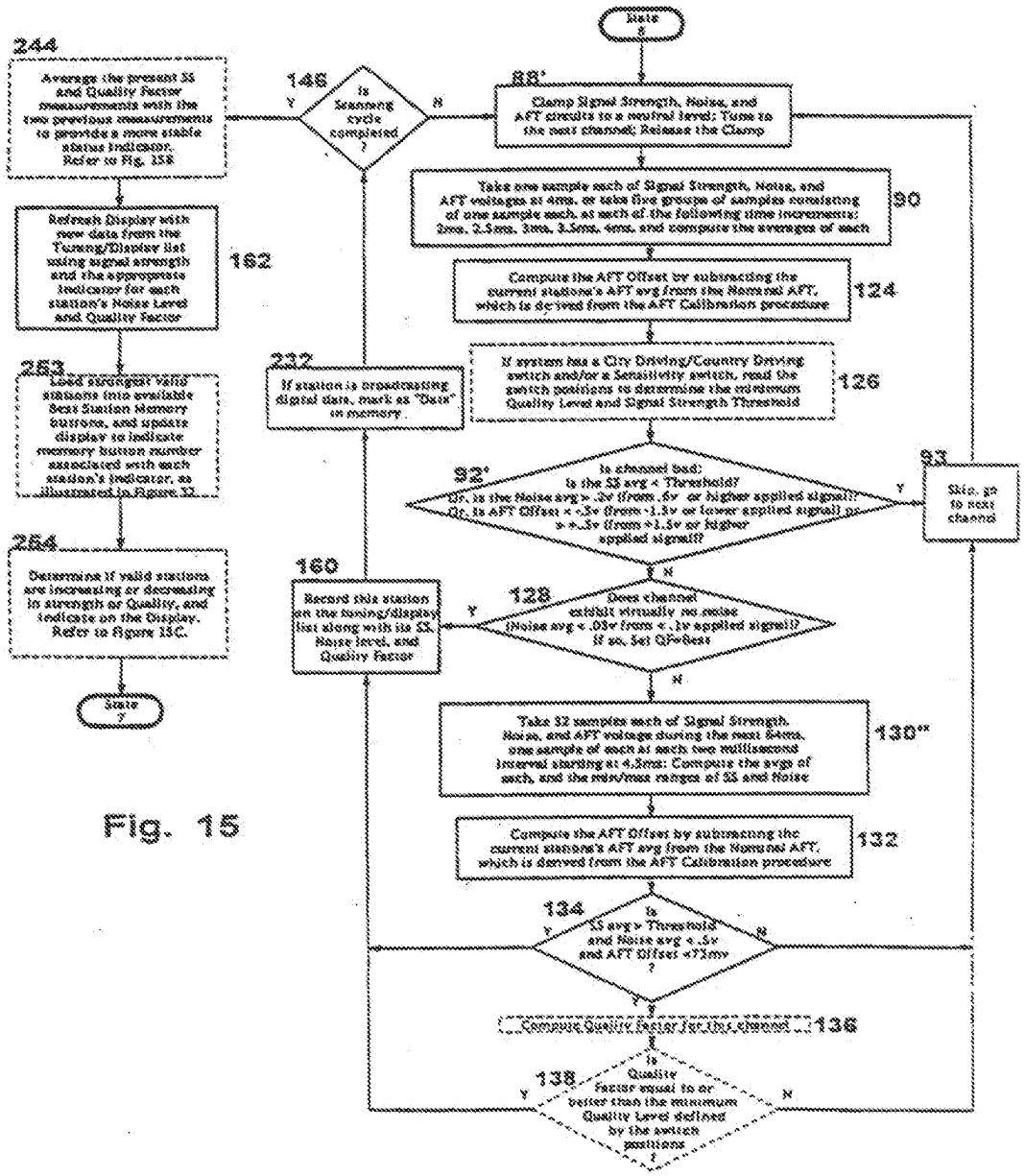
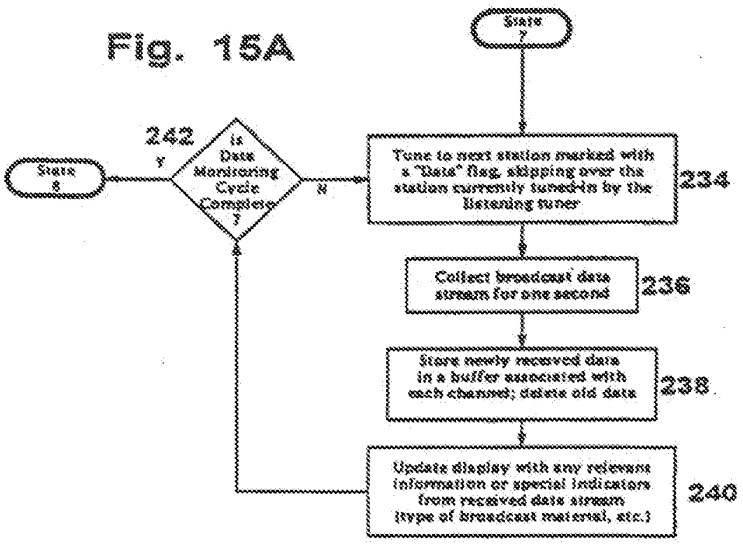

State 0
88'
Clamp Signal Strength, Noise, and AFT circuits to a neutral level; Tune to the next channel; Release the Clamp
146
Is Scanning cycle completed ?
Y
N
244
Average the present SS and Quality Factor measurements with the two previous measurements to provide a more stable status indicator. Refer to Fig. 15B
Refresh Display with new data from the Tuning/Display list using signal strength and the appropriate indicator for each station's Noise Level and Quality Factor
162
263
Load strongest valid stations into available Best Station Memory buttons, and update display to indicate memory button number associated with each station's indicator, as illustrated in Figure 3J
264
Determine if valid stations are increasing or decreasing in strength or Quality, and indicate on the Display. Refer to figure 15C.
State 2
90
Take one sample each of Signal Strength, Noise, and AFT voltages at 4ms, or take five groups of samples consisting of one sample each, at each of the following time increments: 2ms, 2.5ms, 3ms, 3.5ms, 4ms, and compute the averages of each
124
Compute the AFT Offset by subtracting the current stations's AFT avg from the Nominal AFT, which is derived from the AFT Calibration procedure
126
If system has a City Driving/Country Driving switch and/or a Sensitivity switch, read the switch positions to determine the minimum Quality Level and Signal Strength Threshold
232
If station is broadcasting digital data, mark as "Data" in memory
92'
Is channel bad:
Is the SS avg < Threshold?
Or, Is the Noise avg > .2v (from .6v or higher applied signal)?
Or, Is AFT Offset < -.3v (from -1.3v or lower applied signal) or > +.3v (from +1.3v or higher applied signal)?
Y
N
93
Skip, go to next channel
160
Record this station on the tuning/display list along with its SS, Noise level, and Quality Factor
128
Does channel exhibit virtually no noise (Noise avg < .03v from < .1v applied signal)? If so, Set QF=Best
Y
N
130"
Take 32 samples each of Signal Strength, Noise, and AFT voltage during the next 64ms, one sample of each at each two millisecond interval starting at 4.5ms: Compute the avgs of each, and the min/max ranges of SS and Noise
132
Compute the AFT Offset by subtracting the current stations's AFT avg from the Nominal AFT, which is derived from the AFT Calibration procedure
134
Is SS avg > Threshold and Noise avg < .5v and AFT Offset <71mv ?
Y
N
136
Compute Quality Factor for the channel
138
Is Quality Factor equal to or better than the minimum Quality Level defined by the switch positions ?
Y
N

Fig. 15

Fig. 15A


State 7
242
Is Data Monitoring Cycle Complete ?
Y
N
State 8
Tune to next station marked with a "Data" flag, skipping over the station currently tuned-in by the listening tuner
234
Collect broadcast data stream for one second
236
Store newly received data in a buffer associated with each channel; delete old data
238
Update display with any relevant information or special indicators from received data stream (type of broadcast material, etc.)
240

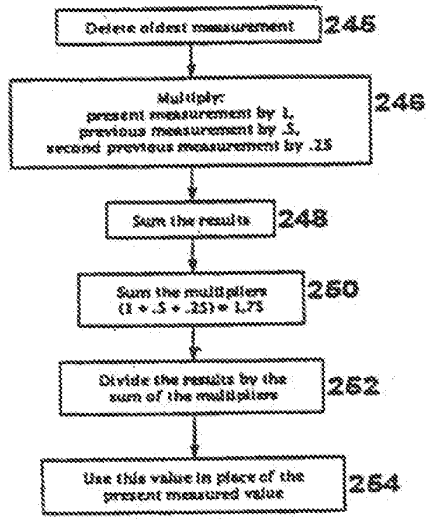


Fig. 15B

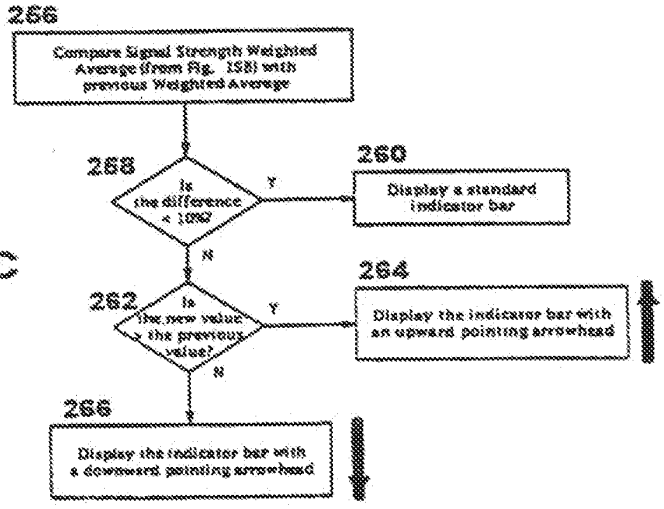
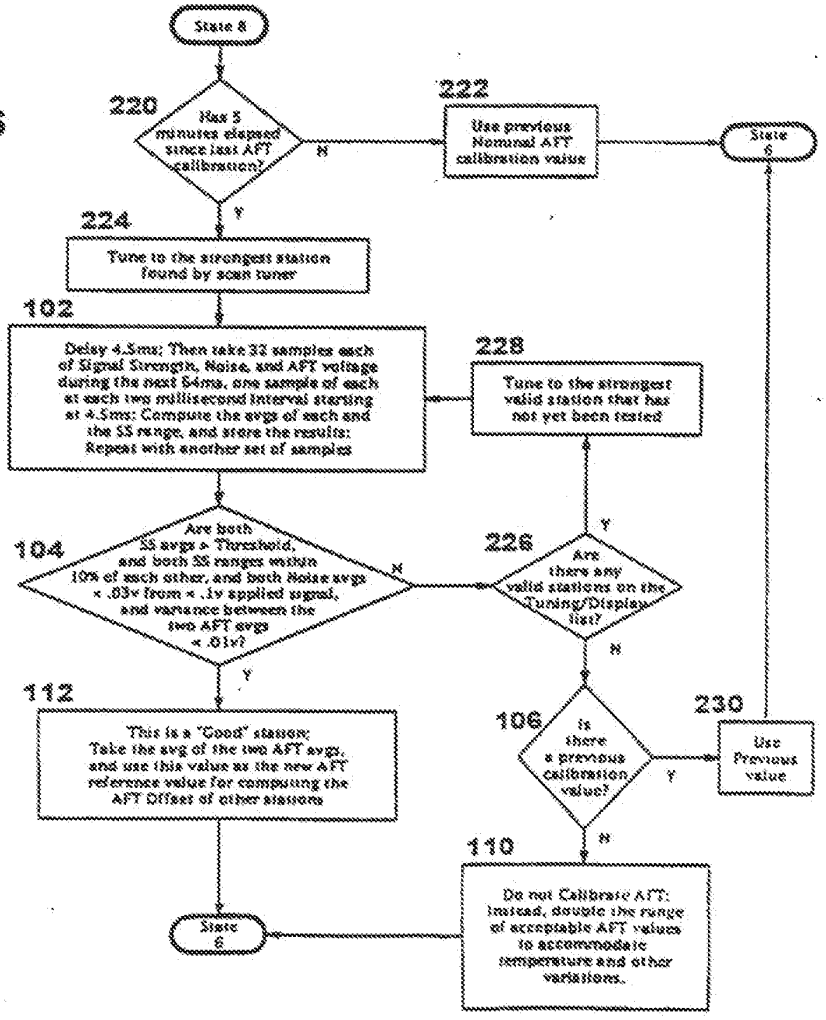


Fig. 15C

Fig. 16


State 8
220
Has 5 minutes elapsed since last AFT calibration?
N
222
Use previous Nominal AFT calibration value
State 6
Y
224
Tune to the strongest station found by scan tuner
102
Delay 4.5ms; Then take 32 samples each of Signal Strength, Noise, and AFT voltage during the next 64ms, one sample of each at each two millisecond interval starting at 4.5ms; Compute the avgs of each and the SS range, and store the results; Repeat with another set of samples
228
Tune to the strongest valid station that has not yet been tested
104
Are both SS avgs > Threshold, and both SS ranges within 10% of each other, and both Noise avgs < .03v from < .1v applied signal, and variance between the two AFT avgs < .01v?
N
226
Are there any valid stations on the Tuning/Display list?
Y
Y
N
112
This is a "Good" station; Take the avg of the two AFT avgs, and use this value as the new AFT reference value for computing the AFT Offset of other stations
106
Is there a previous calibration value?
Y
230
Use Previous value
N
110
Do not Calibrate AFT; Instead, double the range of acceptable AFT values to accommodate temperature and other variations.
State 6

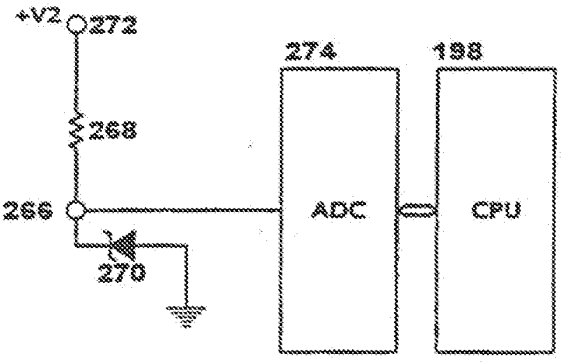


Fig. 17

ILLUSTRATIVE TABLE OF TEMP SENSOR VOLTAGE TO AFT DEVIATION VOLTAGE, SIGNAL STRENGTH THRESHOLD and NOISE REJECTION LIMIT

T. Sensor (V)	Temp	AFT	SS	NOISE
2.80V	5C	-.216V	-12%	-12%
2.85V	10C	-.162V	-9%	-9%
2.9V	15C	-.108V	-6%	-6%
2.95V	20C	-.054V	-3%	-3%
3.0V	25C	0V	0%	0%
3.05V	30C	+.054V	+3%	+3%
3.10V	35C	+.108V	+6%	+6%
3.15V	40C	+.162V	+9%	+9%
3.2V	45C	+.216V	+12%	+12%

Fig. 18

Fig. 19

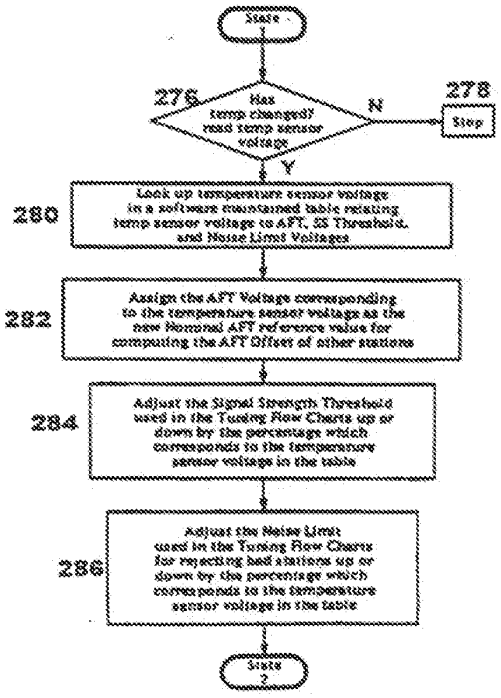


Fig. 19A

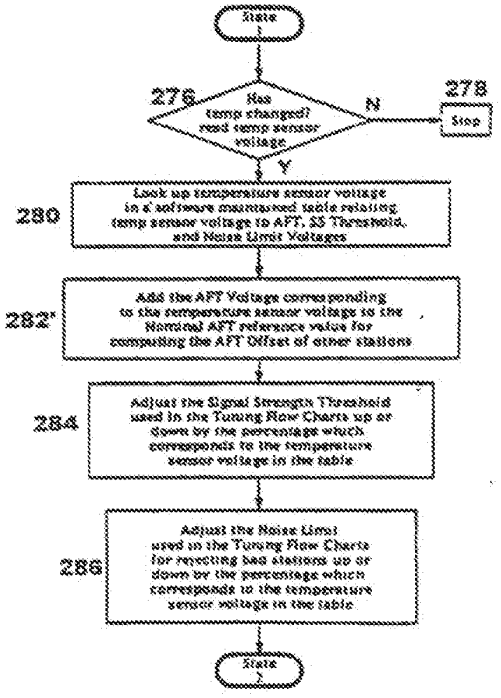


Fig. 20

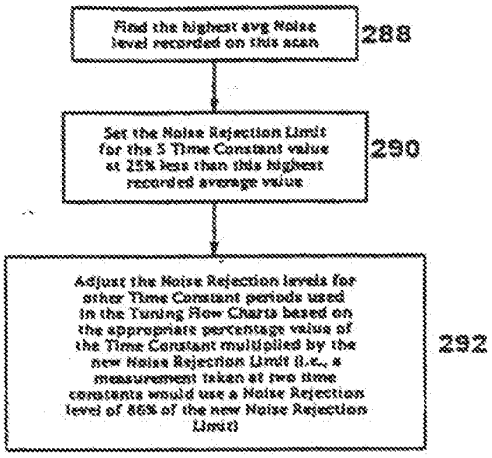
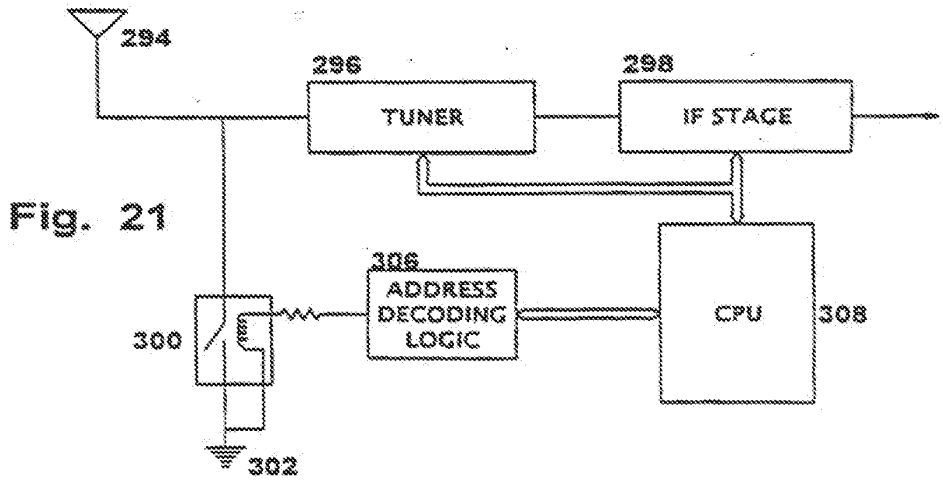

Find the highest avg Noise level recorded on this scan
288
Set the Noise Rejection Limit for the 5 Time Constant value at 25% less than this highest recorded average value
290
Adjust the Noise Rejection levels for other Time Constant periods used in the Tuning Flow Charts based on the appropriate percentage value of the Time Constant multiplied by the new Noise Rejection Limit (i.e., a measurement taken at two time constants would use a Noise Rejection level of 86% of the new Noise Rejection Limit)
292

Fig. 21


294
296
TUNER
298
IF STAGE
306
ADDRESS DECODING LOGIC
CPU
308
300
302

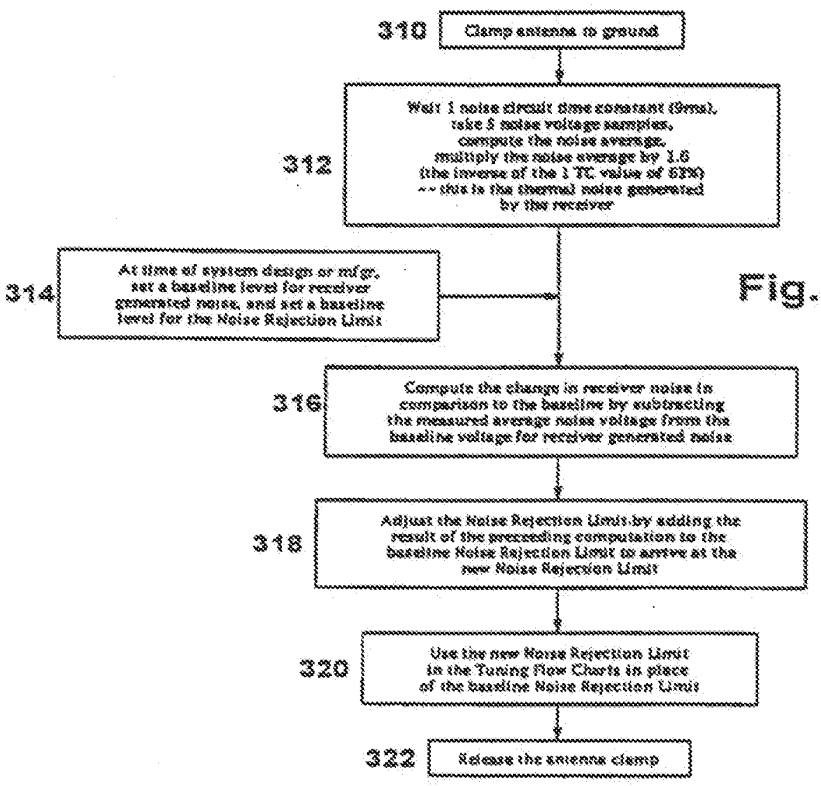

310
Clamp antenna to ground
312
Wait 1 noise circuit time constant (9ms),
take 5 noise voltage samples,
compute the noise average,
multiply the noise average by 1.6
(the inverse of the 1 TC value of 63%)
-- this is the thermal noise generated
by the receiver
314
At time of system design or mfgr.
set a baseline level for receiver
generated noise, and set a baseline
level for the Noise Rejection Limit
316
Compute the change in receiver noise in
comparison to the baseline by subtracting
the measured average noise voltage from the
baseline voltage for receiver generated noise
318
Adjust the Noise Rejection Limit by adding the
result of the preceeding computation to the
baseline Noise Rejection Limit to arrive at the
new Noise Rejection Limit
320
Use the new Noise Rejection Limit
in the Tuning Flow Charts in place
of the baseline Noise Rejection Limit
322
Release the antenna clamp

Fig. 22

25/36

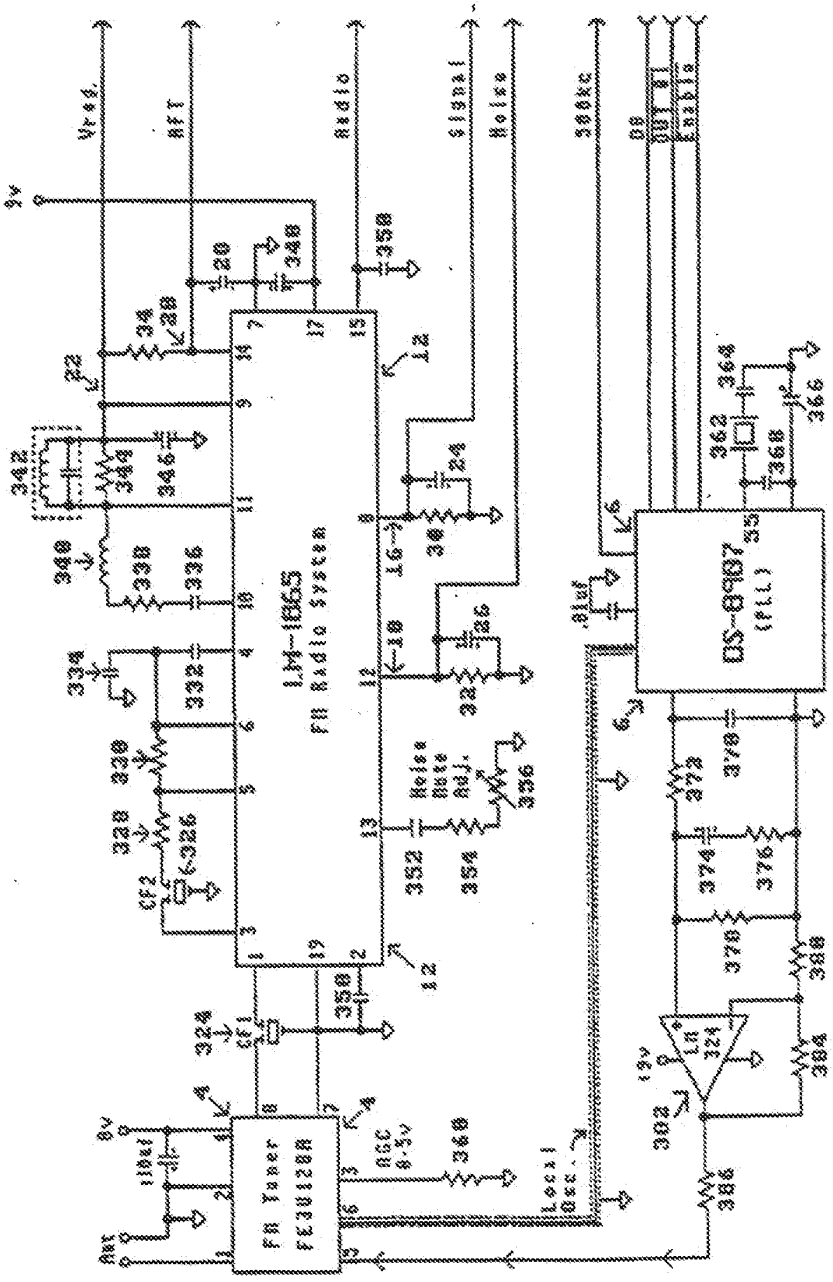

LM-1865
FM Radio System
DS-8907
(PLL)
FM Tuner
FE3U1288
Vreg
IFT
Audio
Signal
Noise
SOOkc
DO
Noise Rate Adj.
Local Osc.
ASC 0.5v
Ant
6v
12v

Fig. 23

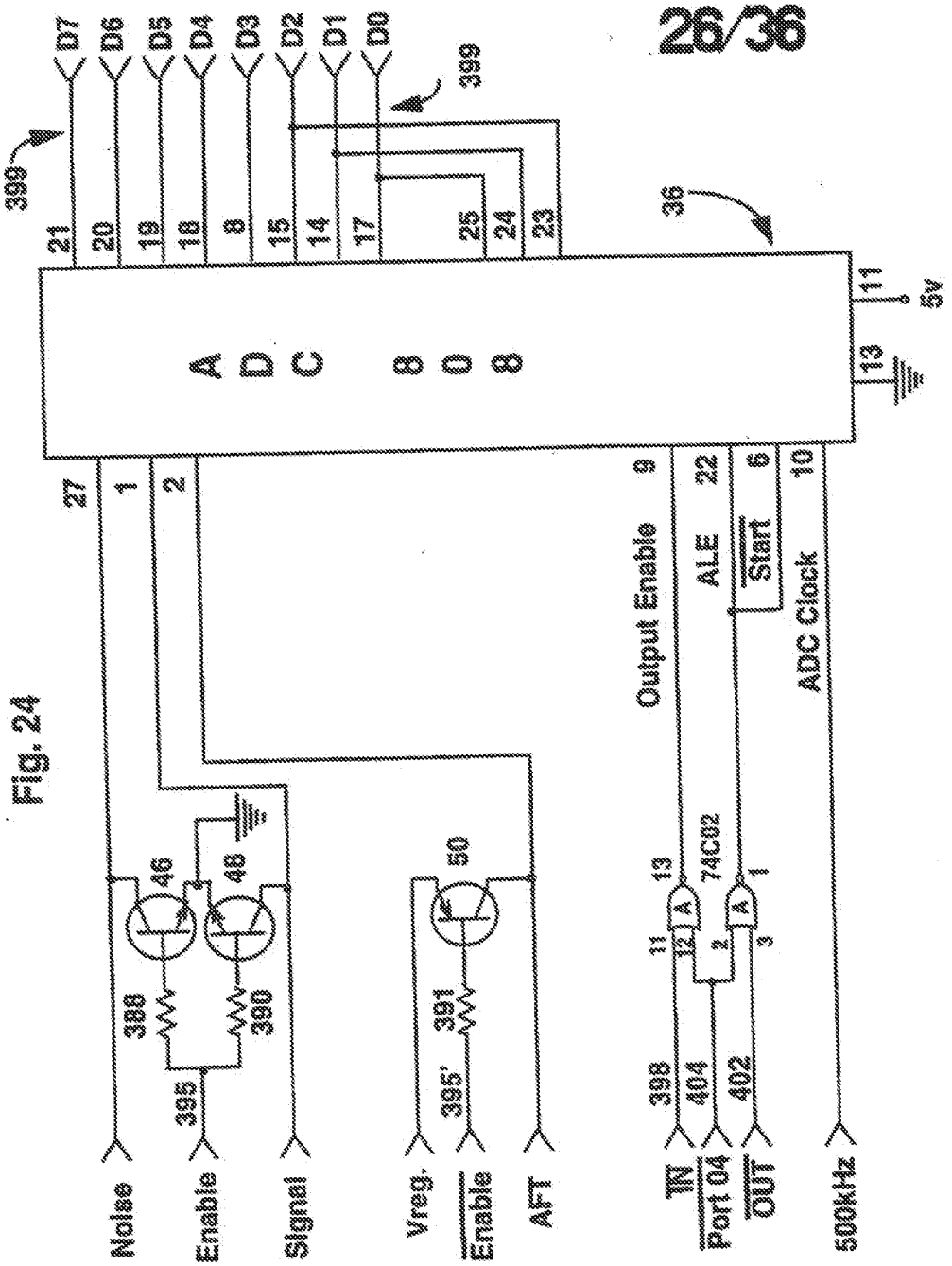

D7
D6
D5
D4
D3
D2
D1
D0
399
399
36
21
20
19
18
8
15
14
17
25
24
23
ADC 808
11
5V
13
27
1
2
9
22
6
10
Output Enable
ALE
Start
ADC Clock
46
48
50
74C02
388
390
391
395
395'
398
404
402
Noise
Enable
Signal
Vreg.
Enable
AFT
IN
Port 04
OUT
500kHz

Fig. 24

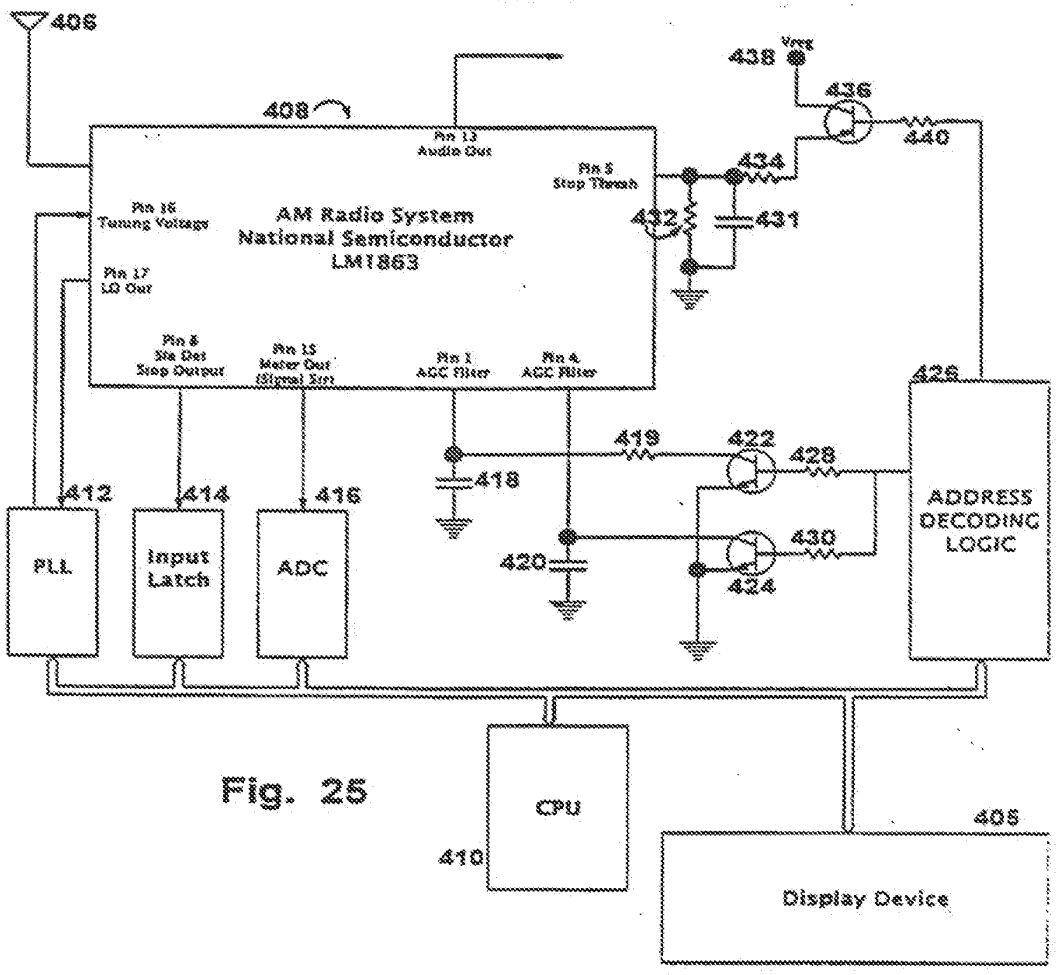

406
408
438
436
440
434
432
431
AM Radio System
National Semiconductor
LM1863
426
419
422
428
418
420
430
424
412
414
416
PLL
Input Latch
ADC
ADDRESS DECODING LOGIC
CPU
410
405
Display Device

Fig. 25

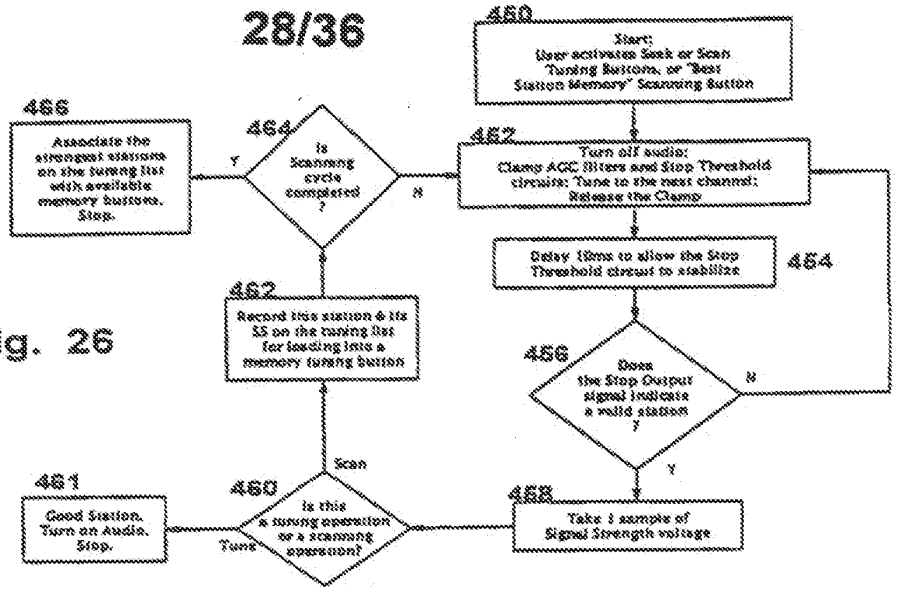

460
Start:
User activates Seek or Scan Tuning Buttons, or "Best Station Memory" Scanning Button
462
Turn off audio;
Clamp AGC filters and Stop Threshold circuits; Tune to the next channel;
Release the Clamp
464
Delay 10ms to allow the Stop Threshold circuit to stabilize
456
Does the Stop Output signal indicate a valid station
Y
N
458
Take 1 sample of Signal Strength voltage
460
Is this a tuning operation or a scanning operation?
Tune
Scan
462
Record this station & its SS on the tuning list for loading into a memory tuning button
464
Is Scanning cycle completed ?
Y
N
466
Associate the strongest stations on the tuning list with available memory buttons. Stop.
461
Good Station. Turn on Audio. Stop.

Fig. 26

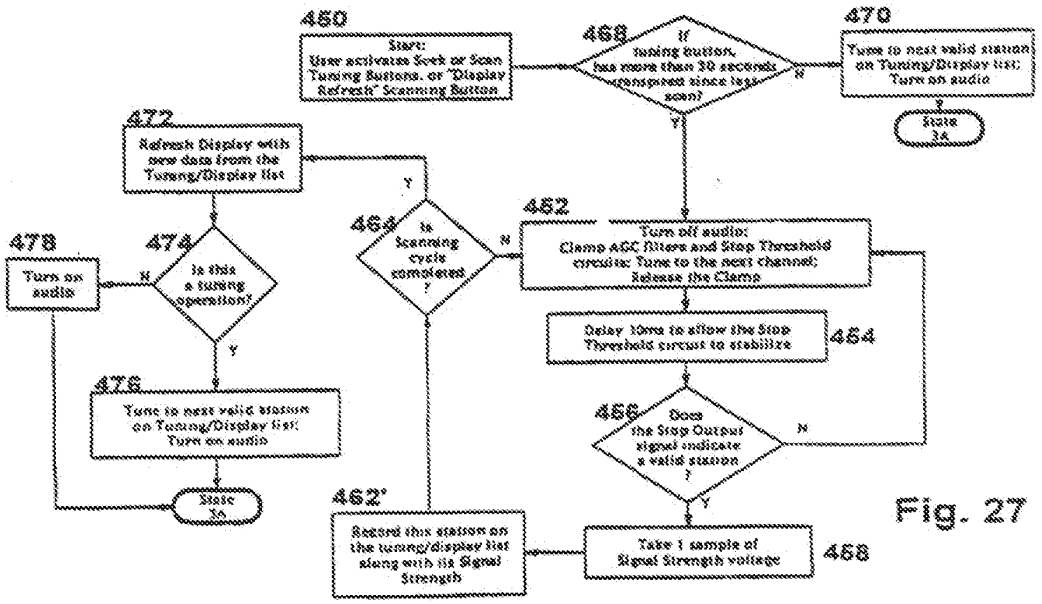

460
Start:
User activates Seek or Scan Tuning Buttons, or "Display Refresh" Scanning Button
468
If tuning button, has more than 30 seconds transpired since last scan?
Y
N
470
Tune to next valid station on Tuning/Display list; Turn on audio
State 1A
472
Refresh Display with new data from the Tuning/Display list
462
Turn off audio;
Clamp AGC filters and Stop Threshold circuits; Tune to the next channel;
Release the Clamp
464
Delay 10ms to allow the Stop Threshold circuit to stabilize
456
Does the Stop Output signal indicate a valid station
Y
N
458
Take 1 sample of Signal Strength voltage
462'
Record this station on the tuning/display list along with its Signal Strength
464
Is Scanning cycle completed ?
Y
N
474
Is this a tuning operation?
Y
N
476
Tune to next valid station on Tuning/Display list; Turn on audio
478
Turn on audio
State 1A

Fig. 27

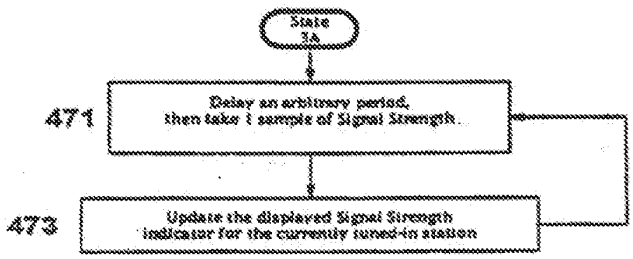

State 3a
471
Delay an arbitrary period, then take 1 sample of Signal Strength.
473
Update the displayed Signal Strength indicator for the currently tuned-in station

Fig. 27A

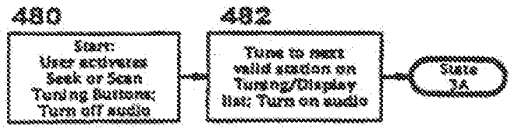

480
Start:
User activates
Seek or Scan
Tuning Buttons;
Turn off audio
482
Tune to next
valid station on
Tuning/Display
list; Turn on audio
State
2A

Fig. 28

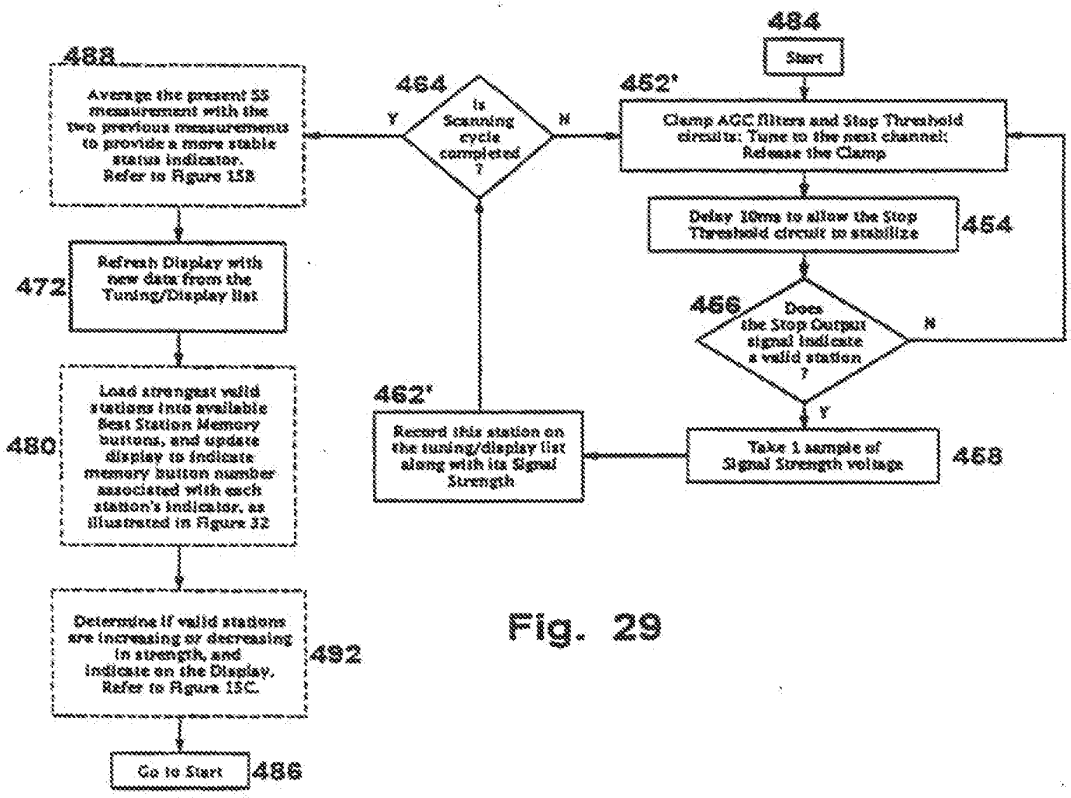

484
Start
452'
Clamp AGC filters and Stop Threshold
circuits: Tune to the next channel;
Release the Clamp
Delay 10ms to allow the Stop
Threshold circuit to stabilize
454
466
Does
the Stop Output
signal indicate
a valid station
?
N
Y
468
Take 1 sample of
Signal Strength voltage
462'
Record this station on
the tuning/display list
along with its Signal
Strength
464
Is
Scanning
cycle
completed
?
Y
N
488
Average the present SS
measurement with the
two previous measurements
to provide a more stable
status indicator.
Refer to Figure 15B
472
Refresh Display with
new data from the
Tuning/Display list
480
Load strongest valid
stations into available
Best Station Memory
buttons, and update
display to indicate
memory button number
associated with each
station's indicator, as
illustrated in Figure 32
492
Determine if valid stations
are increasing or decreasing
in strength, and
indicate on the Display.
Refer to Figure 15C.
Go to Start
486

Fig. 29

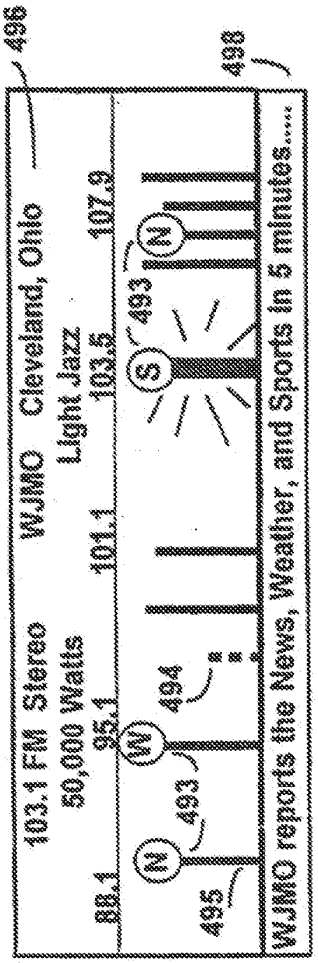


Fig. 30

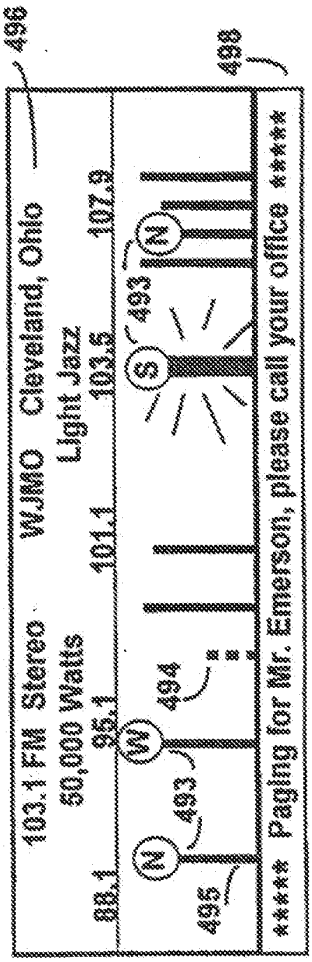


Fig. 30A

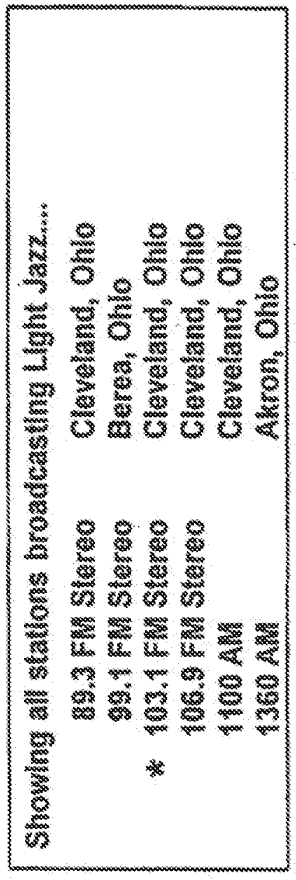


Fig. 30B

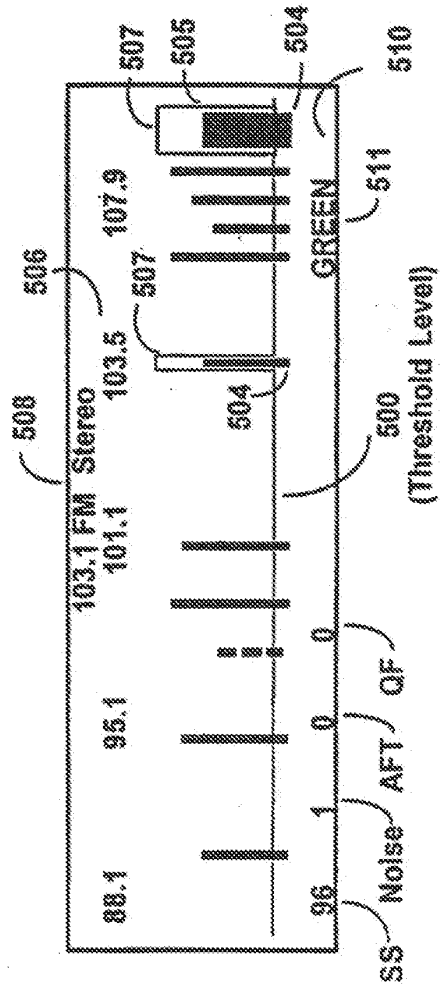


Fig. 31

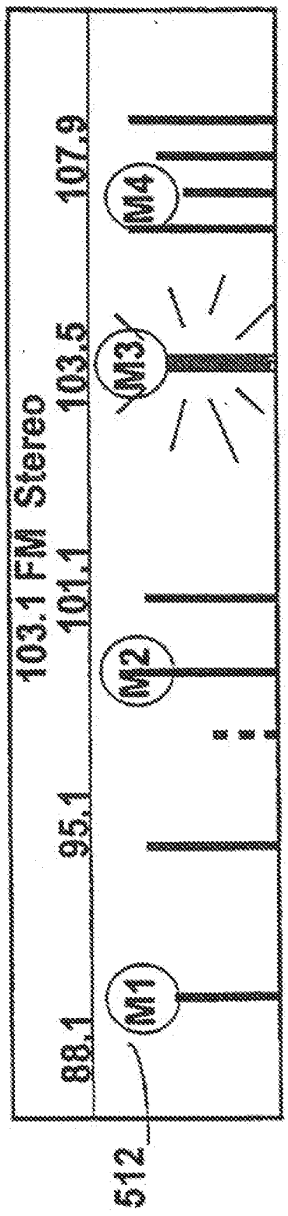


Fig. 32

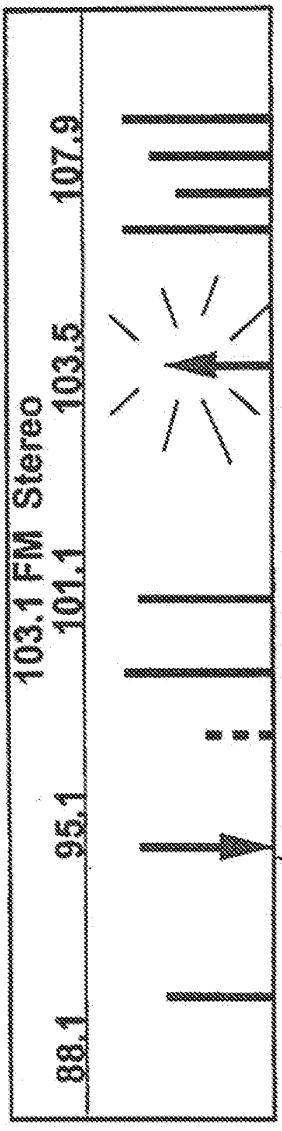


Fig. 32A

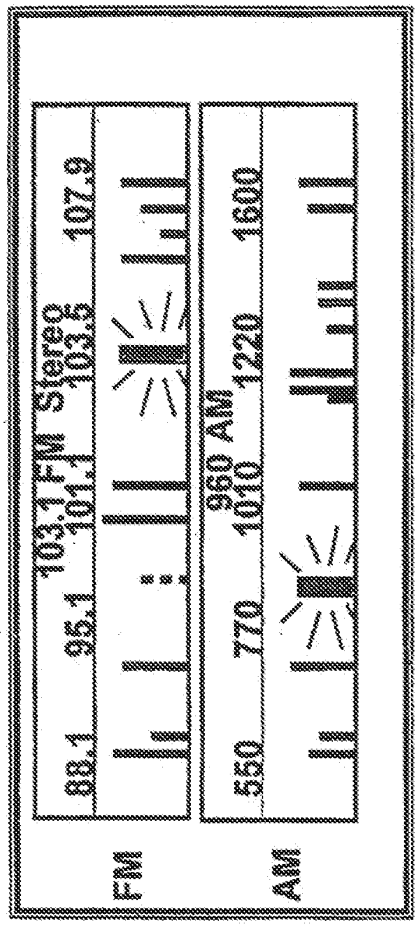


Fig. 33

Fig. 34

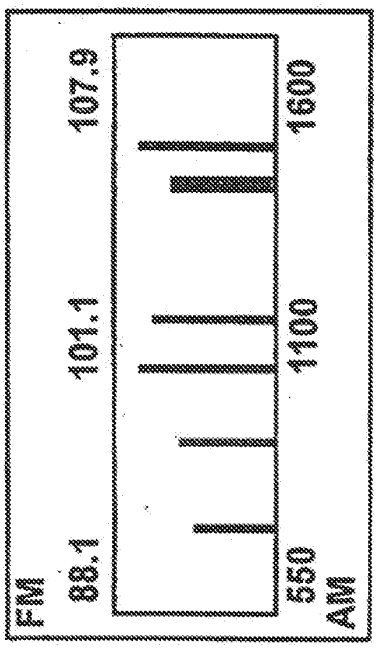


Fig. 35

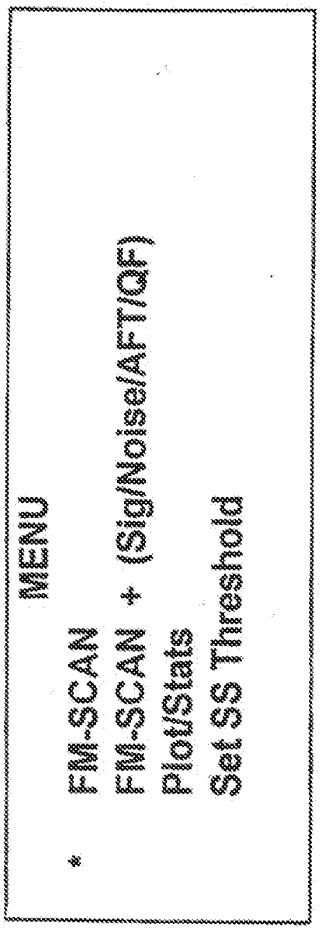


Fig. 36

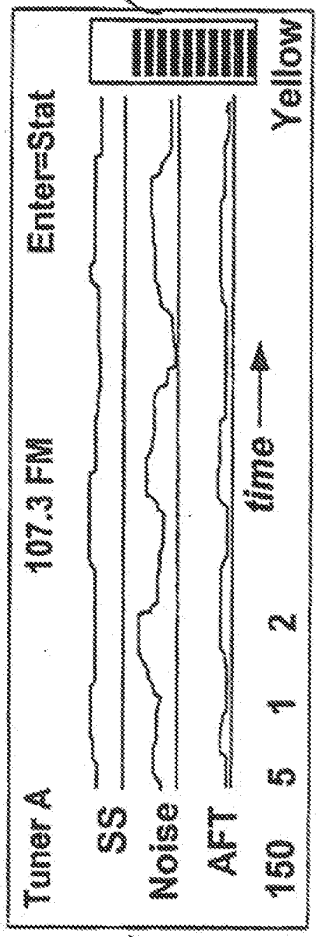


Fig. 37

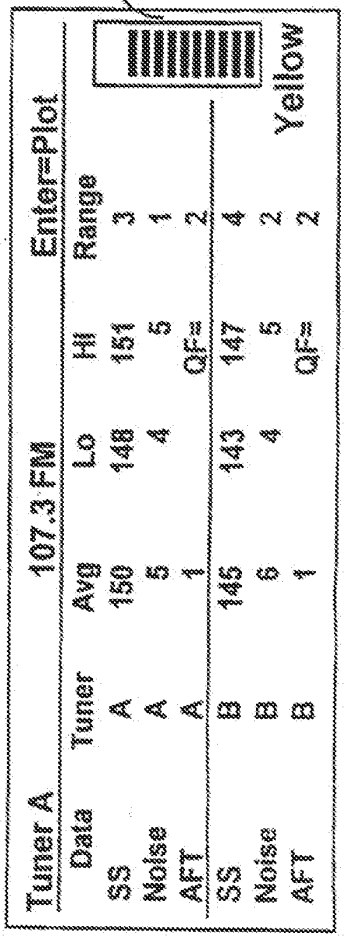


Fig. 38

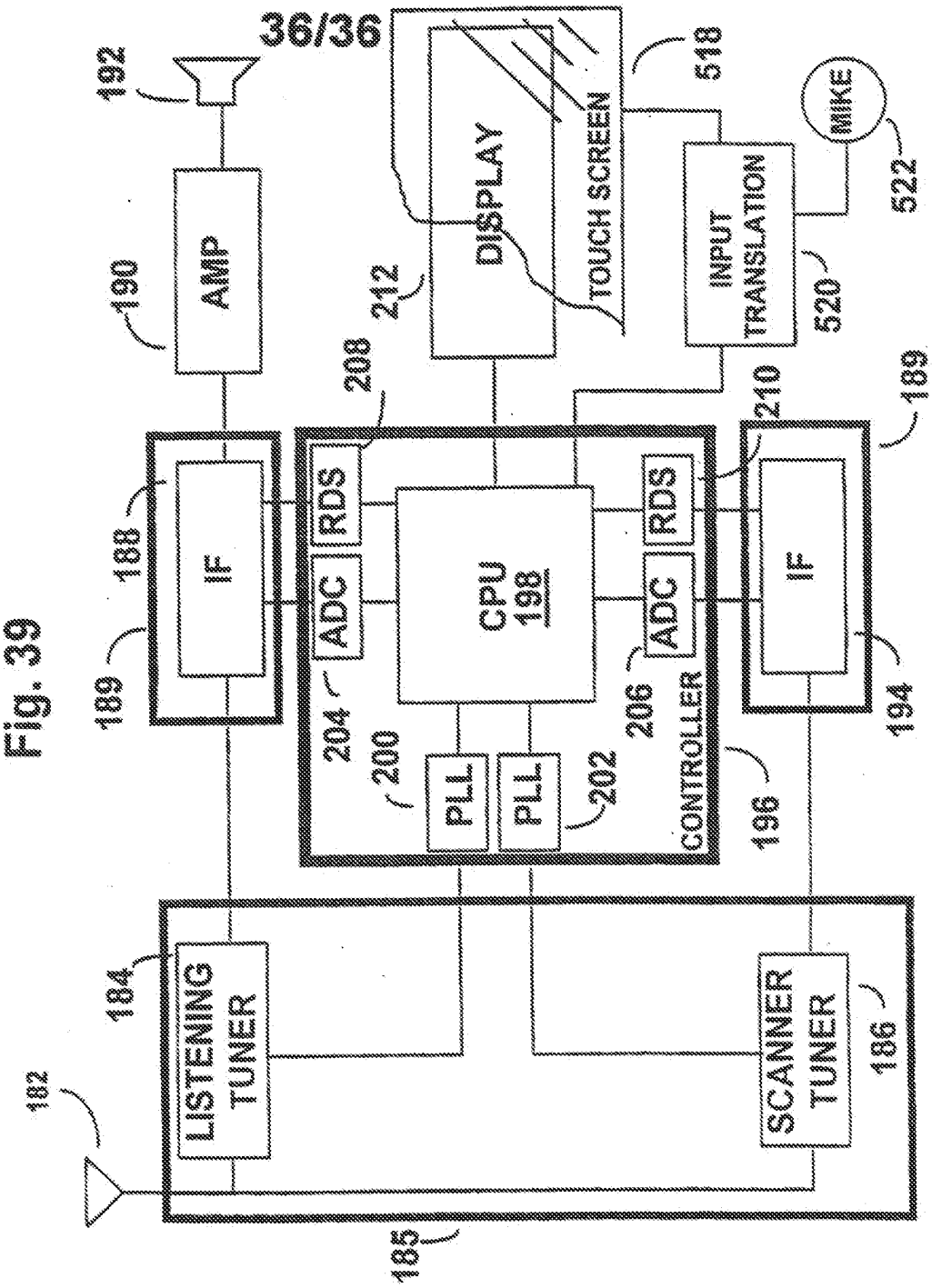

192
AMP
190
DISPLAY
TOUCH SCREEN
518
MIKE
522
INPUT TRANSLATION
520
212
208
210
189
188
IF
189
RDS
ADC
CPU 198
RDS
ADC
IF
194
204
200
PLL
PLL
202
206
CONTROLLER
196
184
LISTENING TUNER
SCANNER TUNER
186
182
185

Fig. 39

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US94/08987

A. CLASSIFICATION OF SUBJECT MATTER
IPC(6) :H04B 17/02
US CL. :Please See Extra Sheet.
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
U.S. : Please See Extra Sheet.

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
NONE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US, A, 5,268,712 (HILPERT ET AL.) 07 DECEMBER 1993, SEE FIGURE 6.	1 --- 2,3,5,6,7,9,11,12-15,17,33,34,35-39, 69, 70, 71
Y	US, A, 4,598,422 (FELLMAN) 01 JULY 1986, SEE ENTIRE DOCUMENT.	35-39
Y	US, A, 5,280,642 (HIRATA ET AL.) 18 JANUARY 1994, SEE FIGURE 2 AND FIGURE 3A.	1-4, 8, 69-73
Y	US, A, 5,101,508 (OWAKI) 31 MAY 1992, SEE FIGURE 5.	16-18

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

* Special categories of cited documents:
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Date of the actual completion of the international search	Date of mailing of the international search report
17 MARCH 1995	06 APR 1995
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer LISA CHAROUEL Telephone No. (703) 305-4847

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US94/08987

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X — Y	JP, A, 52-30302 (MIYATAKE) 09 APRIL 1975, SEE ABSTRACT	1 — 2-7,9,14,17 ,34-39,69-71
Y	US, A, 4,88,815 (AHLEMEYER ET AL.) 19 DECEMBER 1989, SEE FIGURE 1	65-68
Y	US, A, 5,073,975 (ZARABADI ET AL.) 17 DECEMBER 1991, SEE ENTIRE DOCUMENT.	2, 3, 5, 6, 7,9,
Y	US, A, 5,081,707 (SCHORMAN ET AL.) 14 JANUARY 1992, SEE ENTIRE DOCUMENT14	12-17, 34
Y	US, A, 4,763,356 (DAY, JR. ET AL.) 09 AUGUST 1988, SEE FIGURE 2	11, 16,33
Y	US, A, 4,509,203 (YAMADA) 02 APRIL 1985, SEE ABSTRACT	2-7
Y	US, A, 5,313,651 (KURITA) 17 MAY 1994, SEE FIGURE 1 AND ABSTRACT	2-7
Y	US, A, 4,969,209 (SCHWOB) 06 NOVEMBER 1990, SEE FIGURES 2 AND 3	11,16,33

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US94/08987

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

I. CLAIMS 1-34, 69-73 AND 76-77, DRAWN TO A TUNER WITH DISPLAY.
II. CLAIMS 35-64, 74-75, 79-81 AND 82-83, DRAWN TO A TUNING SYSTEM.
III. CLAIMS 65-68 AND 82-83 DRAWN TO A TUNING SYSTEM WITH HIGHWAY/CITY SELECTION.
IV. CLAIMS 78 IS DIRECTED TO A DUAL TUNING SYSTEM, WHICH SHOWS DIFFERENT SPECIAL TECHNICAL FEATURES IN RELATION TO EACH GROUP IDENTIFIED.

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest
☐ The additional search fees were accompanied by the applicant's protest.
☒ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

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PCT/US94/02987

A. CLASSIFICATION OF SUBJECT MATTER:
US CL :

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B. FIELDS SEARCHED
Minimum documentation searched
Classification System: U.S.

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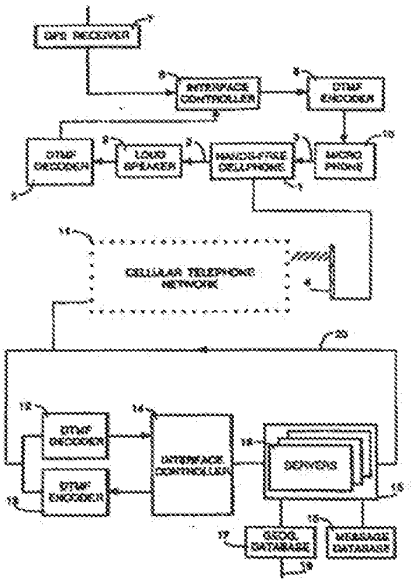
(54) Title: NAVIGATION INFORMATION SYSTEM

(57) Abstract

A navigation information system comprises a communications system having a fixed part (11 to 20) and at least one mobile part (1 to 10), the fixed part including a data storage and processing means (15) for identifying the location of a mobile unit, generating guidance information appropriate to that location and transmitting it to the mobile unit. By locating most of the complexity with the service provider, in particular the navigation computer (15) and geographical database (17), the system can be readily updated and the capital cost of the in-vehicle system, which in its simplest form may be a standard cellular telephone (1), can be minimised. The user makes a request for guidance information, and the system, having determined the user's present location, then transmits instructions to the user. The user's present location can be determined by means such as a Satellite Positioning System (7).



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NAVIGATION INFORMATION SYSTEM

This invention relates to navigation information systems. It is particularly suitable for use in providing users of road vehicles with route guidance, but other applications are possible and are discussed below.

Navigation of a vehicle through an unfamiliar complex road network is a difficult task. Large amounts of fuel and time are wasted as a result of drivers getting lost or using an inefficient route. Accidents can also be caused by drivers attempting to read maps or complex road signs and losing concentration on the road ahead. Moreover, a driver may choose an inefficient route as a result of using an out-of-date map.

An additional problem can occur even if a driver knows a route to his or her destination. That route may be congested or blocked as a result of accidents or maintenance work, so that an alternative route would be more efficient.

Several proposals have been made for navigation guidance systems. In some such proposals a vehicle-borne system has a navigation computer and a geographical information system which is essentially a digitised map stored on a CD-ROM. The system gives the driver information and guidance by screen and/or speech display. These systems would be very expensive. Each vehicle requires a navigation computer and geographical information system. The cost of the complex vehicle-borne equipment involved is estimated to be in the region of £1000. The system is complex to operate, and could only be safely operated by the driver whilst the vehicle is stationary. The geographical information system would require periodic updating, which requires new disks to be distributed to subscribers from time to time.

In some proposed systems of this type real-time data would be broadcast over a radio network to update fixed information held on the geographical information system. Even so, the geographical information system would only be accurate up to its last update. Moreover, a broadcast channel needs to be allocated for the updating service.

It has also been proposed that the guidance service provider collects statistical traffic flow data from which traffic congestion predictions can be made which are fed into the real-time data to be broadcast. The traffic flow data may be

collected using roadside sensors, or they may be collected by monitoring the operation of the mobile user equipment. The latter approach can only collect data relating to users of the system, but has a lower capital cost.

In an alternative approach a system of short-range roadside beacons is used to transmit guidance information to passing vehicles equipped with simple transceivers. The beacons transmit information to suitably equipped passing vehicles to give turn instructions appropriate to their chosen destinations. For each beacon the territory to be covered is divided into as many zones as there are exits from the junction the beacon relates to. The zone in which the user's chosen destination falls is determined, and instructions are given appropriate to that zone. At any given beacon all vehicles whose destinations are in the same zone get the same instruction. The definitions of the zones are dependant on the location of the beacons, and each zone comprises the set of destinations which should be reached from the beacon by taking the direction associated with that zone.

Each beacon only gives instructions for reaching the next beacon along the route to the vehicle's destination. For two vehicles starting from the same point for different destinations for which the routes are initially coincident, the beacons along the coincident section of route will each give both users the same instructions, because for those beacons both users are travelling to the same zone. Only for the beacon at the point of divergence are the two users' destinations in different zones, and therefore different instructions are given.

The beacons' programming may be modified from time to time by control signals from a central control station, in a way analogous to remotely controlled adjustable signposts, but in its interactions with the user equipment the beacon is autonomous, identifying which of its zones the user's desired destination is in, and transmitting the appropriate "turn" information to get it to the next beacon on the way. The beacon has no knowledge of the rest of the route.

Each beacon has a detailed map of a small local area (the boundaries of which are, in fact, the adjacent beacons), and if the destination is in this area the beacon gives full information of the route to the destination. The system can therefore provide a user with directions to a destination defined more precisely than the beacon spacing. However, at the beginning of a journey, a user cannot use the system until he encounters a beacon.

This proposed system allows instant updating of the guidance instructions from a central control, and simpler in-vehicle equipment, but requires vast capital expenditure in roadside beacons.

A problem encountered with both the proposed systems described above is that it is difficult for them to provide alternative routings in response to congestion, either current or future, without the risk of creating worse problems on the alternative routes. Although predictions of regularly occurring congestion peaks are relatively simple to programme into the guidance information, and, at least in the beacon system, real-time updates on road congestion can also be fed to the programming of the beacons, the control system does not have any information of vehicle movements from which to predict future congestion. In any case, if the system is in use by a significant fraction of the vehicles, the system will tend to produce congestion on the diversionary routes.

According to a first aspect of the invention, there is provided a navigation information system for providing information to a mobile user dependant on the location of the mobile user, the system comprising a mobile communications system having a fixed part and one or more mobile part for communicating with the fixed part, the one or more mobile part including means for transmitting to the fixed part a request for guidance information and for receiving guidance information from the fixed part, and the fixed part including:

means for determining the location of a mobile part requesting guidance information,

means for generating guidance information according to the location of the mobile part, and

means for transmitting the guidance information so generated to the mobile part,

whereby information dependant on the location of the mobile unit can be transmitted to the mobile unit.

According to a second aspect of the invention, there is provided a navigation information system for providing information to one or more mobile user dependant on the location of the one or more mobile user, the system comprising:

means for determining the location of a mobile unit requesting guidance information,

means for generating guidance information according to the location of the mobile unit,

and a communications system for transmitting the guidance information so generated to the mobile unit,

whereby information dependant on the location of the mobile unit can be transmitted to the mobile unit.

According to a third aspect of the invention there is provided a mobile unit for a navigation information system, comprising means for receiving guidance instruction information over a communications link, and guidance instruction means controllable by the guidance instruction information received over the communications link, whereby guidance can be communicated to the user by means of the guidance instruction means.

According to a fourth aspect of the invention, there is provided a method of providing navigation information to mobile units of a mobile radio system dependant on the locations of the mobile units comprising the steps of storing navigation data in a fixed part, transmitting a request for navigation guidance from a mobile unit to the fixed part, determining the location of the mobile unit, generating guidance information on the basis of the stored data, location information and the request, and transmitting the guidance information from the fixed part to the mobile unit, whereby information relevant to the location of the mobile unit is transmitted to the mobile unit.

This invention has advantages over both the prior art systems discussed above. Considerable improvements can be made over the prior on-board navigation system proposals by putting the intelligence in the fixed part of the system. Firstly, there is no need to distribute maps or updates to subscribers because the data is held centrally. New roads can be added to the system at the instant they are opened. Total capital expenditure is minimised since all users share the same database. Moreover, the computing resources are used more efficiently, because

an in-vehicle system spends most of its time inactive but a centralised system can be time-shared.

Moreover, in contrast to the prior art roadside beacon system, the invention can be implemented with little deployment of equipment in the field, thereby offering considerable economies in capital cost and maintenance, and allowing rapid installation and modification of the system to meet changing requirements.

Preferably the system includes means for determining the location of the mobile part in relation to a geographical overlay comprising a plurality of overlay areas, and means for transmitting information associated with an overlay area which includes the location of the mobile part, whereby a mobile part within that overlay area receives information associated with that overlay area. This allows information associated with a particular overlay area to be transmitted to any mobile units in that overlay area. The system may also comprise means for determining when a mobile part enters a predetermined overlay area, and means for transmitting a message, to a user other than the said mobile part, in response to the said mobile part entering the predetermined overlay area. For example, one overlay area may cover part of a road approaching a junction, and the message may be the appropriate instruction to the driver, as he approaches the junction, as to which way he should turn. Each individual overlay area therefore gives navigation instructions specific to that overlay area. The overlay areas may overlap, and may be of any size down to the practical minimum of the resolution of the location determination process. Large overlay areas are suitable for transmitting general information, whilst smaller areas can be used to target information to users in very precise locations, such as individual elements of a complicated road layout. The overlay areas may be delimited in two or three dimensions.

An advantage of this preferred arrangement over the fixed beacon systems is that the geographical overlay can be readily modified. Advantageously, the system includes means for storing a digital representation of the geographical overlay, and means for modifying the stored representation such that the configurations of the overlay areas may be selected to meet changing requirements. The overlay areas can be readily combined or subdivided, or their

boundaries otherwise altered to meet changing circumstances without any modification to the hardware, simply by reconfiguring the geographical overlay defined in the central database. Moreover, unlike the prior art beacon system discussed above, there is no major cost in street furniture and supporting infrastructure, because existing cellular mobile communications systems may be used to transmit the instructions from a central database. If the driver enters an overlay area which is not on the route chosen by the system, an error message can be transmitted. Such messages may be transmitted to a user other than the mobile unit, for instance in order to monitor the whereabouts of valuable cargoes or of personnel working away from a base.

The geographical overlay may also be used to operate an access-control system, for example for site security or for levying tolls. In this arrangement, if a user enters an overlay area for which he does not have permission, an alert signal can be sent to a system controller, or to security staff on site who can intercept the interloper. Means may be provided (either in a fixed location or with the mobile user) to store a value associated with the mobile unit, and means arranged to modify the stored value in response to the messages transmitted in accordance with the location of the mobile unit, either to increment the value e.g. for subsequent billing, or to decrement the value e.g. in a prepaid stored-value device.

The fixed part may include means for storing map information or other data for use in providing information, herein referred to as guidance data, means for updating the stored guidance data, means for identifying mobile parts to which the updated data are applicable, and means for transmitting such data over the communications system to the mobile parts so identified. This allows information about changing traffic situations to be transmitted to all users who will be affected, without needing to broadcast the details to other users as would be the case with those prior art systems where updating is possible.

Although the information transmitted to the user is specific to the location, information about the user can be processed centrally. This allows short-term traffic predictions to be made. The guidance data transmitted to the mobile units can therefore be based on the position measurements of a plurality of the mobile parts. If the mobile parts are vehicles, these position measurements will identify the locations of roads, and an indication of their traffic density. As new roads are

built or routes are diverted, traffic will move to the new routes. Measuring the position of the traffic will therefore result in the data being updated automatically. To reduce the volume of information transmitted, the fixed part may comprise means for transmitting to the mobile part an expected range of movement information and for receiving from the mobile part movement measurements outside the expected range, and the mobile part comprising means for measuring location and time to derive movement information, means to compare the movement information with the expected range received from a fixed part of the system, and means to automatically report to the fixed system movement measurements outside the expected range. In this way only exceptional traffic conditions are reported.

The fixed part may include means for generating and maintaining guidance data based on vehicle movement data derived from time information and position measurements of a plurality of the mobile parts and/or estimations of future locations of the mobile parts based on the guidance information previously transmitted to the mobile parts. Estimations of future locations of the mobile parts based on the guidance information previously transmitted to the mobile parts can be used to make estimates of future traffic situations.

The data stored in the data storage means may be updated, for example in response to changing traffic conditions, accidents, or highway maintenance. The system may include means for identifying the mobile units to which the updated data are applicable, and transmitting amended instructions over the communications system to said mobile parts. With knowledge of the journeys being planned by a large number of users, a better prediction of demand for particular roads (and hence of congestion on those roads) can be built up. This can be more stable than existing autonomous route-planning systems because the navigation system can take account of the journeys planned for other users.

Advantageously the invention can be implemented using a public cellular radio data service on an individual dial-up basis, providing a simple mechanism for billing and avoiding the need for a separate radio transmission system.

The means for determining the location of the mobile part may comprise means to interrogate a location-identifying means forming part of the mobile part operating for example by means of dead reckoning from a known start point, using

an inertial navigation system or distance and direction measuring devices such as a compass and an odometer. Alternatively, the means for locating position may include means for identifying the location of the mobile part in relation to elements of the fixed part of the communications system. The location of the mobile part may be determined by a radio location system associated with the cellular radio system. In another alternative arrangement, a satellite navigation system may be used. In one preferred arrangement the fixed part has means to determine the approximate location of the mobile part, and the location identifying means of the mobile part is arranged to respond to a location request from the interrogation means with a non-unique location signal which, in combination with the approximate location determined by the fixed part, determines a unique location.

In a preferred arrangement, the fixed part and the mobile parts each have a satellite navigation system receiver, and the positions of the mobile parts as measured by the satellite navigation system are compared with those of the fixed part as measured by the satellite navigation system. The position of the fixed part can be known with great accuracy and provides a reference measurement which allows the position of the mobile part to be determined with greater accuracy than is possible by direct measurement using the satellite system alone.

Preferably the fixed part has one or more servers and means for allocating a server to a mobile part only when it requires service. In practice only a very small number of mobile units will require service at any given time, so this allows the computing resources of the fixed part to be used most efficiently, and the system can support many more mobile units in total than it has server capacity for. This is in contrast to the prior art system discussed above, in which each mobile unit requires a dedicated computer carried on board, which is only used for a fraction of the time. Moreover, all the servers can use a common road-use database, which can use the information on routes it has planned for mobile users to build a prediction of future road use status, such as likely congestion points, and build this into its guidance instruction process. For example the system can be arranged such that it does not direct more than a predetermined number of users to use a particular stretch of road at a particular time, and finds alternative routes for any users who would otherwise be directed along that road at that time. In this way the system can predict likely congestion points and take pre-emptive action.

The mobile part may include guidance instruction means controllable by instructions contained in the guidance information transmitted from the fixed part over the communications link, whereby guidance instructions can be communicated to the user by means of the guidance instruction means.

For some applications the vehicle may be controlled directly in response to the guidance information received over the communications link. However, for use on the public highway, it is preferable that the guidance information controls display means, which may be visual or audible or both, to indicate to a driver the direction to take.

The guidance instruction means may be programmable from the fixed part over the communications link, either automatically or by a human operator. The guidance instruction means may include a speech synthesiser, which may be located in the fixed part, transmitting voice messages to the user over the communications system, or may be located in the mobile unit and controlled by data messages from the fixed part. The former arrangement allows the mobile unit to be simplified, whilst the latter arrangement requires a smaller signalling load.

In the described embodiment the mobile part is in a vehicle, but it may be a hand-held device for guiding a pedestrian. In one form, the mobile part may be a conventional mobile cellular radio unit. This allows a basic service to be provide to a user without the need for any dedicated equipment.

Embodiments of the invention will now be described by way of example with reference to the drawings, in which:

Figure 1 shows a mobile part and a fixed part of a navigation information system according to an embodiment of the invention;

Figure 2 illustrates how the invention may be applied to a simple road layout;

Figure 3 illustrates the division of a territory into zones according to the instructions generated by the system;

Figure 4 illustrates an application of the invention to a more complex road layout;

Figures 5a and 5b illustrate the modification of an overlay in response to a change in traffic circumstances; and

Figure 6 illustrates a road network, showing overlay areas defined by the method of the invention in relation to a cellular radio network.

According to the embodiment of Figure 1 the navigation system has a fixed part (comprising elements 12 to 19) and a number of mobile parts, of which one only is shown (comprising elements 1 to 10), interconnected by a cellular telephone network 11.

The mobile part comprises a mobile telephone 1 having an audio output 2, an audio input 3 and a radio antenna (transmit/receive) 4. The output 2 is connected to a decoder 6 to translate Dual-Tone Multi-Frequency (DTMF) signals received by the telephone 1 into data which is fed to an interface controller 6. The interface controller 6 also receives input from a GPS (Global Positioning System) satellite receiver 7. The interface controller transmits data to a DTMF encoder 8 which generates tones to be fed to the audio input of the mobile telephone. The audio output 2 and input 3 also include a loudspeaker 9 and microphone 10 respectively, to allow the telephone to be used for speech.

The fixed part comprises an interface with the cellular telephone network 11, connected through a DTMF decoder 12 and encoder 13 and a controller interface 14 to a computer 15. The computer 15 comprises a number of servers 16, one of which is allocated to each active mobile unit. The servers 16 have access to a geographical database 17, and a database of standard messages 18. The geographical database 17 is updateable through updating input 19. The database 17 stores the definitions of a number of overlay areas which together form a geographical overlay to the territory to be covered. Examples of overlays are illustrated in Figures 2, 4, 5a, 5b, and 6, to be described in detail later.

The mobile part obtains location information using the GPS receiver 7 and transmits this information, together with a request for directions to a specified destination, to the fixed part, where a server 16 relates the location information to its geographical database 17 and obtains message information associated with the location from the database 18, and transmits the information back to the mobile part.

The computer 15 may transmit messages in DTMF code, using the encoder 12, or it may generate voice messages which are transmitted through a voice output 20 to the cellular network 11.

DTMF signals are used to transmit the position of the vehicle to the computer 15 which can then offer information and guidance either to the vehicle or to a third party on demand.

In the following discussion, variations on the basic apparatus depicted in Figure 1 will also be described, in which certain elements are modified or replaced.

The system is operated as follows:-

At the start of a journey the driver requests service by activating a pre-dialled control on the telephone 1. This service request is transmitted to the control interface 14 over the telephone network 11. The control interface 14 then allocates a free server 16 to answer the call and interrogate the vehicle GPS receiver 7 to determine its geographical position. The encoder 8 takes the latitude and longitude data and translates the numbers into DTMF tone-pairs, in a manner to be described in more detail below.

The cellular telephone couples this audio signal into its speech input path. This is easy to do with a hands-free vehicle-mounted cellular telephone since the microphone lead is accessible or alternatively, a small transducer can be mounted next to the microphone 10. A DTMF receiver 5 coupled to the loudspeaker 9 (again acoustically or electrically) decodes supervisory data (again in DTMF format) coming back from the server 16 to acknowledge the reception of location messages. If no acknowledgement is received by the DTMF unit then the data message is repeated.

The fixed end of the system comprises a DTMF decoder 12 and encoder 13 coupled to a serial data interface 14 of the server computer 15. This computer, on the one hand, can call the mobile part which will answer automatically and then provide its location using the DTMF signalling system or on the other hand can receive an unsolicited call, which would include the DTMF encoded identity of the mobile unit and would also provide the vehicle location using the DTMF interface 6.

The server 16 then captures the current position of the user, and identifies the overlay area within which that position falls. The server also captures any permanent user-specific information such as the type of vehicle, which may be relevant for the route to be selected e.g. because of height or weight restrictions. The user may encode those requirements which are not permanent, but are

specific to the present information request, (in particular his destination) by using the telephone keypad in response to voice prompts. However, in a preferred arrangement the call is presented to a human operator for the capture of this data. This allows the user to obtain assistance in identifying his desired destination to the system, and also allows the driver to speak his requirements, keeping his hands and eyes free for driving.

The operator then remotely programs the in-vehicle interface 6 with system data identifying the vehicle destination, for use in subsequent update processes, and instigates the generation of voice given directions and instructions to the driver by a speech generation subsystem of the computer server 16.

Position fixes may be made at regular intervals, e.g. every two minutes, or every kilometre. Alternatively the fixed part may request the mobile unit to send its next position fix after a specified interval or distance.

As the driver follows the route further instructions can automatically be sent as the driver enters each new overlay area and the driver can be alerted if the route has been left or if any new traffic problems have been detected that will affect the individual driver. The system is arranged such that when the system locates a mobile unit entering an overlay area having a message defined for it, for example the next turn instruction (or an error message if the mobile unit has gone off the selected route), that message is transmitted. The system may also be arranged to transmit messages to users other than the mobile unit in question, for example to monitor the progress of valuable cargoes.

At any time the driver can call the human operator if service requirements change or additional help is needed.

Because a central database is used all vehicle movements can be monitored. Traffic models can be used to optimise traffic flows and reduce journey times. The system can also ensure that it does not itself cause congestion, by limiting the number of vehicles it directs to use the same road at the same time. The control system can use the location data to calculate and record movement vectors from these vehicles.

Using the data collected by this method, it is possible for the central system to derive a digital map of valid routes. The following data could be derived automatically: valid travel lanes; permitted direction(s) of flow; allowable turns;

average travel times; trends in travel times according to time of day and other factors.

The system would automatically update the map to show permanent changes (new road links, changes to one way systems etc.). Temporary lane closures from road works etc. would also be recorded. Manual updating of data would be necessary (for instance to alert the system to a new bypass opening) before the system acquired the information from vehicle flow data, to ensure vehicles are routed over the new road initially. Any approximations in the pre-entered data would automatically be corrected by the system described here.

The system could be further enhanced to include any other information that may be relevant to travellers, by a combination of manual and automated data entry, e.g. location of bus stops, telephone boxes and other street furniture, and proximity to enterprises such as shops, banks or offices.

The variation of transit time trends according to time of day, for each link, could be used to derive a congestion prediction model, as the basis for route guidance. The system may monitor the progress of the mobile units along the routes selected for them, to identify any areas of traffic congestion etc, by comparing actual transit times between predetermined locations. This may be done by the fixed system monitoring the location updates of individual units, or it may be done by the mobile unit, in co-operation with the fixed unit. In this latter case, the fixed part transmits an expected range of transit times within which the mobile is expected to reach a predetermined location. If the mobile unit reaches the location outside this range, it reports the fact to the fixed part. By "reporting by exception" the data processing overhead can be reduced considerably.

However, these systems can become unstable if too many drivers have access to route guidance based on information about current or predicted congestion. To avoid these instabilities route plans are created and updated centrally and passed to individual vehicles. The impact of these vehicles using the suggested routes is then added to the prediction. As more vehicles use the system the prediction produced could become more accurate.

The routes derived can be passed to the vehicles (via a mobile data link, or possibly a short range communications link or other temporary access to a fixed

telecommunications network - prior to departure). The vehicle would then operate autonomously, unless the road conditions varied significantly from those predicted.

If the central system detected a problem (from vehicle data or other sources), which had a severe impact on predictions, sufficient to cause a change to advice already given, then the central system could broadcast news of the problem, such that those vehicles affected could automatically call in via a mobile data communications link to receive a new route from its present location to its destination.

If a vehicle system encountered unexpected transit times along its programmed route it would send a report to the central system.

The data flowing though the system will therefore allow it to "learn" more of the road network's characteristic congestion behaviour, e.g. by use of neural net techniques, and to select routes for traffic which avoid using routes at times when they are likely to be congested. In addition, the system can generate digital road maps or other data automatically, based on the position measurements of vehicles using the roads.

A particular advantage of this system is the ability to predict unusual patterns of congestion from the route guidance information requested by the users. Because route guidance is generated centrally, the system can monitor the number of requests for destination information to a given location. By determining the predicted arrival times for each user (which will depend on their starting points, and the time the journey started), a build-up of traffic converging on a particular location at a particular future time (e.g. for a major sporting event) can be detected. Traffic for other destinations, which might have been routed by way of this location, can then be diverted to other routes.

The system described above uses an analogue telecommunications link, in which DTMF codes may be used. For an analogue cellular radio network DTMF is an ideal signalling medium when only short status messages are required to be transmitted. It can survive in the severe signal fading and noise of the mobile environment which frequently precludes the use of fast phase or frequency shift data modulation. Another advantage is the ability to co-exist with speech. For example a DTMF data burst containing vehicle position data could be sent at the start of a call and at intervals during the call. Other simple coded DTMF

messages can also be conveyed to indicate emergencies, provide simple driver indications (e.g. illuminated arrows to turn left or right) or trigger synthetic speech generated by another sub-system in the vehicle.

The DTMF coding described above is suitable for an analogue system. In a digital cellular network digitised data can be transmitted over an associated packet data system such as the Short Message Service (SMS) of GSM (Global System for Mobile Communications), or the General Packet Radio Service (GPRS) proposed for GSM.

In the embodiment described above, the speech generation subsystem forms part of the server 16. Alternatively, it can be carried on board the vehicle. In this arrangement the subsystem has various stored speech commands which are controlled from the in-vehicle interface 6 in response to commands transmitted from the fixed part. This arrangement reduces the signalling traffic required over the radio link 11, but increases the complexity of the in-vehicle equipment.

The location-determination system will now be described in greater detail. GPS (Global Positioning System) satellite navigation receivers are now becoming very cheap and are available with a serial data output. These can provide latitude and longitude data to within a tenth of a second of arc (defining position to within 3 metres, which is sufficient to identify which carriageway of a dual carriageway road a user is on).

Satellite positioning systems such as the Global Positioning System (GPS) are prone to small systematic errors, for example as a result of instabilities in the orbits of the satellites. The accuracy of the position measurement may be enhanced by a process known as "Differential GPS" in which a number of fixed reference points are used, whose positions are determined with great precision e.g. using surveying techniques. GPS is used to obtain a measure of the position of one or more of the fixed reference points. This measure is compared with the known, true location to generate a correction value which can be used to correct the position of the mobile unit as measured by GPS.

The position data received from the satellite positioning system may include some redundant data. If the system is only to operate within a limited area of the globe the most significant digits of the position data are redundant, and need not be transmitted from the mobile unit to the fixed part. For example, any

point in Germany can be uniquely defined by the units digits of its latitude and of its longitude, as that country lies entirely between 45 and 55 degrees North, and between 5 and 15 degrees East. It is also possible to define any point in the United Kingdom in this way, although in that case a 10 degree offset in longitude has to be applied to avoid duplication of longitudes East and West of the zero meridian.

For larger territories e.g. a pan-European system, or one covering the USA, this simple method of data reduction is impractical. However, it is nevertheless possible to reduce the data requirements by dynamically defining the territory. After an initialisation step using the full location, the system selects as each new location the closest candidate to the previous one. For example, if the mobile unit was last reported at 99 degrees W and the units digit of the longitude is now 0, the user is taken to be at 100 degrees W rather than, for example, 90 degrees or 110 degrees.

If location updates take place sufficiently frequently that the user's position cannot have changed by more than half a degree, the units digit of degrees may also be dispensed with, and the location given only in minutes and seconds of arc. The more frequent the updates, the more digits can be dispensed with.

An alternative method of obtaining the coarse position location is interrogation of the cellular radio system's operating system to identify the cell in which the user is currently located. Cell sizes can be up to about 40km across (although they are often much smaller, so identifying the cell can identify the user's location to within 40km, which identifies latitude to better than half a degree. (1 degree of latitude = 111km). The separation of lines of longitude varies with the cosine of the latitude but even at the Arctic Circle (66 degrees North) a 40km resolution will identify longitude to the nearest whole degree (1 degree of longitude = 111km (cos latitude) = approximately 45km at 66 degrees North).

By left-truncating the position data by omitting the degrees digits a basic position message would therefore consist of 10 decimal digits (minutes, seconds, and tenths of seconds). Altitude data giving altitude in metres would require a further four digits, since all points on the Earth's surface lie within a range of 10,000 metres, but this data can also be left-truncated, as it is unlikely that any multi-level road system would exceed 100 metres in height (or if it did, that a GPS

system would work effectively for any receiver on the lower levels). This gives a total of twelve digits, which can be transmitted by DTMF in less than 2 seconds.

If the data is left-truncated as described above, the "coarse" data is added by the interface controller 14 by reference to the previous position or to the cellular radio operating system.

When the computer 15 receives a location message, it stores the location and then searches its database for an overlay area within which that position lies. The overlay areas are defined in the database by co-ordinates of latitude and longitude and have associated attributes which define messages which can be passed to mobile subscribers within the overlay area defined. In some instances height (altitude) information, also available using satellite positioning systems, may be used, for example to distinguish between levels in a multi-level highway intersection. When a DTMF location message has co-ordinates which fall inside an overlay area having an associated message, the message is then transmitted to the mobile part as a computer synthesised speech message, a DTMF coded message (to activate other subsystems) or as a high speed conventional data message.

If the mobile unit fell within the same overlay area at the previous location update, and the message associated with that overlay area is unchanged, the transmission of the message may be suspended.

The frequency at which location updates are requested by the system may be tailored to the size and nature of the current overlay area. For example, an intricate road layout may comprise a large number of small overlay areas, requiring frequent location updates to ensure that a user does not miss an instruction by passing through its associated area between two updates. However, a long stretch of road without junctions may be covered by a single overlay area, so less frequent updates are appropriate. The speed with which a vehicle is likely to be moving, which will differ between urban, rural, and motorway environments may also be used as a factor in determining when the next location update should be requested.

As suggested above, there may be circumstances when a satellite positioning system may be unusable, for example in tunnels or built-up areas where a line-of-sight view of the satellites may be impossible to obtain. Alternative arrangements for identifying and updating the mobile part's location which do not

rely on a satellite receiver may be used, either on their own, or to interpolate between points where a satellite system can be used. In one variant, a navigation system based on dead-reckoning may be used. In such systems the user identifies his initial location and the on-board system measures the system's movement e.g. by magnetic bearing measurements, distance counters, and inertial navigation means such as gyrocompasses and accelerometers. Such systems are self-contained, but require knowledge of the starting point. This may be obtained, for example from a satellite positioning system.

In another variant, a method of location may be used which relies on the propagation characteristics of the cellular radio system used for communication with the central control station. Examples of such systems are disclosed in German Patent specifications DE3825661 (Licentia Patent Verwaltungs) and DE 3516357 (Bosch), United States Patent 4210913 (Newhouse), European Patent specification EP0320913 (Nokia), and International Patent applications WO92/13284 (Song) and WO 88/01061 (Ventana). By comparison of signal strength or other characteristics of several cellular base stations, a position fix can be determined. In this arrangement the location measurement may be made directly by the fixed system. This allows the mobile part of the system to be embodied by a conventional cellular telephone, with inputs being provided by speech, or by DTMF tones generated by the keypad, and instructions to the user being transmitted by voice commands.

Examples of the kind of navigation information which may be stored in the database 17 will now be discussed, with reference to Figures 2 to 6. Briefly, Figure 2 shows a junction J having four approach roads 21,22,23, 24; each having associated with it an overlay area 21a, 22a, 23a, 24a respectively. In this figure, and all other figures illustrating road layouts, the roads are shown arranged for left-hand running, as used for example in the UK, Japan, Australia etc. Figure 3 shows part of a road network surrounding the junction J, including towns A, B, C, and a motorway M. Each of the roads 21, 22, 23, 24 has an associated destination zone 21z etc. Figure 4 shows a complex grade-separated junction interlinking four roads N, S, E, W. The junction has superimposed on it an overlay having twelve overlay areas, Na, Ni, Nd, Sa, Si, Sd, Ea, Ei, Ed, Wa, Wi, Wd. Figure 5a shows a small region having a main road 33 and a side road 30. The main road 33 has two

associated overlay areas 31, 32. Figure 5b is similar to Figure 5a, but an obstruction X is present on the main road 33, and the overlay area 32 has been subdivided into two overlay areas 32a, 32b, separated by the obstruction. Figure 6 shows an overlay comprising ten overlay areas 40 - 49 superimposed on a cellular radio coverage region comprising five cells 50 - 54.

In greater detail, the road junction J (Figure 2) has four approach roads 21, 22, 23, 24. On each road, at the approach to the junction, an overlay area (21a, 22a, 23a, 24a) is defined. These overlay areas have directional information associated with them, giving turn instructions or other navigational information. As shown in Figure 3, the entire territory covered by the navigation system can be divided into four zones 21z, 22z, 23z, 24z, each comprising the set of all locations for which the corresponding road 21, 22, 23, 24 should be taken from the junction J. In this particular example, road 24 leads directly into town A and is only used for local destinations (zone 24z), road 23 leads to town B (zone 23z), road 22 leads to town D (zone 22z) and road 21 leads to the motorway M, for all other destinations including town C and part of town A. These zones are defined differently for each junction: for example at junction J' different directions are appropriate for towns A and C, so these towns fall in different zones with respect to the overlay areas at that junction. The zones may even be defined differently for different overlay areas at the same junction. For example, if U-turns are not possible at the junction J, any traffic approaching the junction J by road 22 and requiring town D (perhaps as the result of a previous error, or a change of plan) must be routed by way of roads 21, M, and 25. Thus, for overlay area 22a there are only three zones: 24z, 23z and the combined 21z/22z, corresponding to the three permitted exits 21, 23, 24.

The zones may be re-defined according to circumstances. For example, when the motorway M is congested, the best route from junction J to town C may be by way of town B. In such circumstances, zones 21z and 23z are redefined so that town C now falls within zone 23z. It should be noted, however, that the total number of zones remains the number of exit routes from the relevant overlay area.

The overlay areas 21a, 22a, 23a, and 24a should be large enough to ensure that any vehicle approaching the junction gets at least one location update whilst within the relevant overlay area, and is thus sent the relevant turn

instruction. As shown in Figure 2, these overlay areas are discrete, and may be considered equivalent to the coverage areas of the beacons of the prior art system discussed above. They may, however, be made contiguous, as shown in Figures 4, 5a, 5b and 6.

Figure 4 shows a more complex, grade-separated junction, in which there are twelve overlay areas. Each road N, E, S, W intersecting at the junction has a corresponding approach overlay area Na, Ea, Sa, Wa, (Wa shown shaded), and a depart overlay area Nd, Ed, Sd, Wd (Ed shown shaded). There are also four intermediate overlay areas Ni, Ei, Si, Wi (Si shown shaded). In the vicinity of the flyover F height (altitude) information obtainable from the GPS system can be used to determine which level, and therefore which overlay area, the user is currently in.

The approach and intermediate overlay areas each end at a decision point P1 to P8. In the database 17 each overlay area has direction information associated with it, providing instructions as to which fork to take at the associated decision point. For example, the direction information associated with zone Si instructs users for destinations served by road N to go straight on at point P1, and users for destinations served by roads E, S, and W to turn left. It will be seen that traffic using the intersection will pass through one approach overlay area, one departure overlay area, and may also pass through one or more intermediate overlay areas. There may also be information associated with the departure overlay areas Nd, Sd, Ed, Wd, for example warning of hazards ahead. The departure overlay areas may be continuous with approach overlay areas for the next junction in each direction.

As a user approaches the junction on road S, a location update identifies the user equipment as being within overlay area Sa. If the co-ordinates of the user's destination are within the zone served by road W, the user is sent an instruction to turn left at point P2. If the user obeys this instruction, he will enter overlay area Wd and on the next location update he will be sent information relevant to that overlay area (if any).

If the co-ordinates of the user's destination are within the zone served by road N, the user in overlay area Sa is instead sent an instruction to continue straight on at point P2. If the user obeys this instruction, he will enter overlay area Si.

For a user in overlay area Si, if the co-ordinates of the user's destination are within the zone served by road N the user is sent an instruction to go straight on at point P1. On obeying this instruction, he will enter the overlay area Nd and on the next location update he will be sent information relevant to that overlay area (if any).

If the co-ordinates of the destination of a user in overlay area Si are in the zone served by roads E, S, or W, the user will be sent an instruction to turn left at point P1. On obeying this instruction, he will enter overlay area Wi.

Similar information is associated with the other overlay areas. By being given appropriate instructions as the user negotiates a succession of junctions (decision points), the user can be directed to any destination. It should be noted that all users who are to be directed to the same exit from the junction are given the same instruction, whatever their ultimate destination.

Figures 5a and 5b illustrate the reconfiguration of the overlay areas to meet changing circumstances. Initially (Figure 5a) an overlay area 31 is defined for the approach to a junction between a major road 33 and a side road 30, and a second overlay area 32 is defined for that part of the major road 33 beyond the junction. Information associated with the overlay area 31 includes turn information to instruct traffic for the zone served by the side road 30 to turn off. Information may also be associated with the overlay area 32.

In figure 5b the major road 33 has been blocked at a point X. In order to accommodate this, the overlay area 32 has been subdivided into two overlay areas 32a, 32b. The information (if any) associated with overlay area 32b is the same as that previously associated with overlay area 32. Traffic in overlay area 32a is given new information warning it of the hazard ahead. The information associated with the overlay area 31 is modified, so that all traffic is now instructed to turn off onto the side road 30. (Effectively this means that the destination zones associated with the overlay area 31 are merged into one)

Figure 6 shows how the overlay areas may be defined for a road network. In this example there is an overlay area 40, 41, 42, 43, 44, 45, 46, 47, 48, 49 corresponding to each side of each section of road. Information appropriate to each direction of travel on each section is therefore available to users throughout the relevant section. Superimposed on this overlay there is a cellular radio network,

five cells of which (50, 51, 52, 53, 54) are shown. The position of the user, as determined for example by a satellite positioning system, determines which overlay area is appropriate to the user. The information is transmitted to the service control centre by means of the cellular radio network. Handovers between cellular base stations occur in conventional manner at cell boundaries. These handovers are, however, unrelated to the boundaries between the overlay areas 40 - 49

Although the described embodiment relates to the provision of route guidance information, other locality-dependant information may be provided as well, or instead, such as information about local facilities, tourist attractions, weather forecasts, public transport information, etc. The term "guidance information", as used in this specification, embraces any such information.

CLAIMS

1. A navigation information system for providing information to a mobile user dependant on the location of the mobile user, the system comprising a mobile communications system having a fixed part and one or more mobile part for communicating with the fixed part, the one or more mobile part including means for transmitting to the fixed part a request for guidance information and for receiving guidance information from the fixed part, and the fixed part including:

means for determining the location of a mobile part requesting guidance information,

means for generating guidance information according to the location of the mobile part, and

means for transmitting the guidance information so generated to the mobile part,

whereby information dependant on the location of the mobile unit can be transmitted to the mobile unit.

2. A system as claimed in Claim 1, the fixed part including means for determining the location of the mobile part in relation to a geographical overlay comprising a plurality of overlay areas, and means for transmitting information associated with an overlay area which includes the location of the mobile part, whereby a mobile part within that overlay area receives information associated with that overlay area.

3. A system as claimed in Claim 2, including means for storing a digital representation of the geographical overlay, and means for modifying the stored representation such that the configurations of the overlay areas may be selected to meet changing requirements.

4. A system according to Claim 2 or 3, including means for determining when a mobile part enters a predetermined overlay area, and means for transmitting a message to the mobile part in response to the mobile part entering the predetermined overlay area.

5. A system according to Claim 2, 3, or 4 including means for determining when a mobile part enters a predetermined overlay area, and means for transmitting a message, to a user other than the said mobile part, in response to the said mobile part entering the predetermined overlay area.

6. A system according to claim 4 or 5, including means to store a value associated with the mobile part, and means arranged to modify the stored value in response to the message.

7. A system as claimed in any preceding claim, having means for locating the position of the mobile part by radio location

8 A system as claimed in Claim 7, wherein the means for locating position comprises a satellite navigation system receiver and/or means for identifying the location of the mobile part in relation to elements of the fixed part of the communications system.

9. A system as claimed in any preceding claim, wherein the means for determining the location of the mobile part comprises means to interrogate a location-identifying means forming part of the mobile part.

10. A system as claimed in claim 9, wherein the fixed part has means to determine the approximate location of the mobile part, and wherein the location identifying means of the mobile part is arranged to respond to a location request from the interrogation means with a non-unique location signal which, in combination with the approximate location determined by the fixed part, determines a unique location.

11. A system as claimed in any preceding claim, wherein the mobile part has means for locating its position by dead reckoning

12. A system as claimed in any preceding claim, the fixed part including means for generating and maintaining guidance data based on vehicle movement data derived from time information and position measurements of a plurality of the mobile parts and/or estimations of future locations of the mobile parts based on the guidance information previously transmitted to the mobile parts.

13 A system according to any preceding claim wherein the fixed part comprises means for transmitting to the mobile part an expected range of movement information and for receiving from the mobile part movement measurements outside the expected range, and the mobile part comprises means for measuring location and time to derive movement information, means to compare the movement information with the expected range received from a fixed part of the system, and means to automatically report to the fixed system movement measurements outside the expected range.

14. A system according to any preceding claim, the fixed part including means for storing guidance data, means for updating the stored guidance data, means for identifying mobile parts to which the updated data are applicable, and means for transmitting such data over the communications system to the mobile parts so identified.

15. A system according to any preceding claim, wherein the mobile part includes guidance instruction means controllable by instructions contained in the guidance information transmitted from the fixed part over the communications link, whereby guidance instructions can be communicated to the user by means of the guidance instruction means.

16. A system according to any preceding claim, wherein the fixed part has input means operable by a human operator to input guidance instruction requests to the fixed part.

17. A navigation information system for providing information to one or more mobile user dependant on the location of the one or more mobile user, the system comprising:

means for determining the location of a mobile unit requesting guidance information,

means for generating guidance information according to the location of the mobile unit,

and a communications system for transmitting the guidance information so generated to the mobile unit,

whereby information dependant on the location of the mobile unit can be transmitted to the mobile unit.

18. A system as claimed in Claim 17, including means for determining the location of a mobile unit in relation to a geographical overlay comprising a plurality of overlay areas, and means for transmitting information associated with an overlay area which includes the location of the mobile unit, whereby a mobile part within that overlay area receives information associated with that overlay area.

19. A system as claimed in Claim 18, including means for storing a digital representation of the geographical overlay, and means for modifying the stored representation such that the configurations of the overlay areas may be selected to meet changing requirements.

20. A system according to Claim 18 or 19, including means for determining when a mobile unit enters a predetermined overlay area, and means for transmitting a message to the mobile unit in response to the mobile unit entering the predetermined overlay area.

21. A system according to Claim 18, 19, or 20 including means for determining when a mobile unit enters a predetermined overlay area, and means for transmitting a message, to a user other than the said mobile unit, in response to the said mobile unit entering the predetermined overlay area.

22. A system according to claim 20 or 21, including means to store a value associated with the mobile unit, and means arranged to modify the stored value in response to the message.

23. A system as claimed in any of claims 17 to 22, the means for determining the location of a mobile unit comprising means to interrogate a location-identifying means of a co-operating mobile unit to determine its position,.

24. A system as claimed in any of claims 17 to 23, wherein the means for locating position comprises means for identifying the location of the mobile unit in relation to elements of the fixed part of the communications system.

25. A system as claimed in claim 24, wherein the means for locating position comprises means to determine the approximate location of the mobile unit, means to receive a non-unique location signal from the mobile unit, and means to combine the approximate location information with the non-unique location information to determine a unique location.

26. A system as claimed in any of claims 17 to 25, including means for generating and maintaining guidance data based on vehicle movement data derived from time information and position measurements of a plurality of the mobile parts

27. A system according to any of claims 17 to 26, having means for transmitting to the mobile part an expected range of movement information, and for receiving from the mobile part movement measurements outside the expected range.

28. A system according to any of claims 17 to 27, including means for storing guidance data, means for updating the stored guidance data, means for identifying mobile units to which the updated data are applicable, and means for transmitting such data over the communications system to the mobile units so identified.

29. A system as claimed in any of claims 17 to 28, having input means operable by a human operator to input guidance instruction requests.

30. A mobile unit for a navigation information system, comprising means for receiving guidance instruction information over a communications link, and guidance instruction means controllable by the guidance instruction information received over the communications link, whereby guidance instructions can be communicated to the user by means of the guidance instruction means.

31 A mobile unit for a navigation information system comprising means for measuring location and time to derive movement information, means to compare the movement information with an expected range received from a fixed part of the system, and means to automatically report to the fixed system movement measurements outside the expected range.

32 A method of providing navigation information to mobile units of a mobile radio system dependant on the locations of the mobile units comprising the steps of storing navigation data in a fixed part, transmitting a request for navigation guidance from a mobile unit to the fixed part, determining the location of the mobile unit, generating guidance information on the basis of the stored data, location information and the request, and transmitting the guidance information from the fixed part to the mobile unit, whereby information relevant to the location of the mobile unit is transmitted to the mobile unit.

33. A method as claimed in Claim 32, wherein the location of the mobile unit is determined in relation to a geographical overlay comprising a plurality of overlay areas, generating information associated with an overlay area which includes the location of the mobile part, and transmitting the information associated with the

relevant overlay area to the mobile part, whereby a mobile part within that overlay area receives information associated with that overlay area.

34. A method as claimed in claim 33, including the step of storing a digital representation of the geographical overlay, and modifying the stored representation such that the configurations of the overlay areas may be selected to meet changing requirements.

35. A method according to Claim 33 or 34, comprising the further steps of determining when a mobile unit enters a predetermined overlay area, and transmitting a message to the mobile unit in response to the mobile unit entering the predetermined overlay area.

36. A method according to Claim 33, 34, or 35 including the further steps of determining when a mobile unit enters a predetermined overlay area, and transmitting a message to a user other than the said mobile unit in response to the mobile unit entering the predetermined overlay area.

37. A method according to claim 35 or 36 including the further step of modifying a stored value associated with the mobile unit in response to the message.

38. A method as claimed in any of claims 32 to 37, wherein the position of the mobile unit is identified by a radio location method.

39. A method as claimed in Claim 38, wherein the position of the mobile unit is determined by means of a satellite navigation system and/or by identifying the location of the mobile part in relation to elements of the fixed part of the communications system.

40. A method according to any of Claims 32 to 39, wherein the fixed unit interrogates the mobile unit to identify its location.

41. A method as claimed in claim 40 wherein the fixed part determines the approximate location of the mobile part, and wherein the mobile part responds to a location request from the interrogation means with a non-unique location signal which, in combination with the approximate location determined by the fixed part, determines a unique location.

42. A method as claimed in any of claims 32 to 41, wherein the mobile unit identifies its position by dead reckoning.

43. A method according to any of Claims 32 to 42, including the steps of generating and maintaining data based on vehicle movement data derived from time information and position measurements of a plurality of the mobile parts and/or estimations of future locations of the mobile parts based on the guidance information previously transmitted to the mobile parts.

44. A method according to any of claims 32 to 43 wherein the fixed part transmits to the mobile part an expected range of movement information, and the mobile part measures location and time to derive movement information, compares the movement information with the expected range received from the fixed part of the system, and reports to the fixed system movement measurements outside the expected range.

45. A method as claimed in any of Claims 32 to 44 including the further steps of the updating the stored data, identifying the mobile units to which the updated data are applicable, and transmitting such data over the communications system to said applicable mobile parts.

46. A method as claimed in any of claims 32 to 45, wherein the guidance information transmitted to the mobile unit controls guidance instruction means forming part of the mobile unit, whereby guidance instructions can be communicated to the user of the mobile unit.

47. Apparatus substantially as described with reference to the accompanying drawings

48. A method substantially as described with reference to the accompanying drawings

1/4

Fig.1.

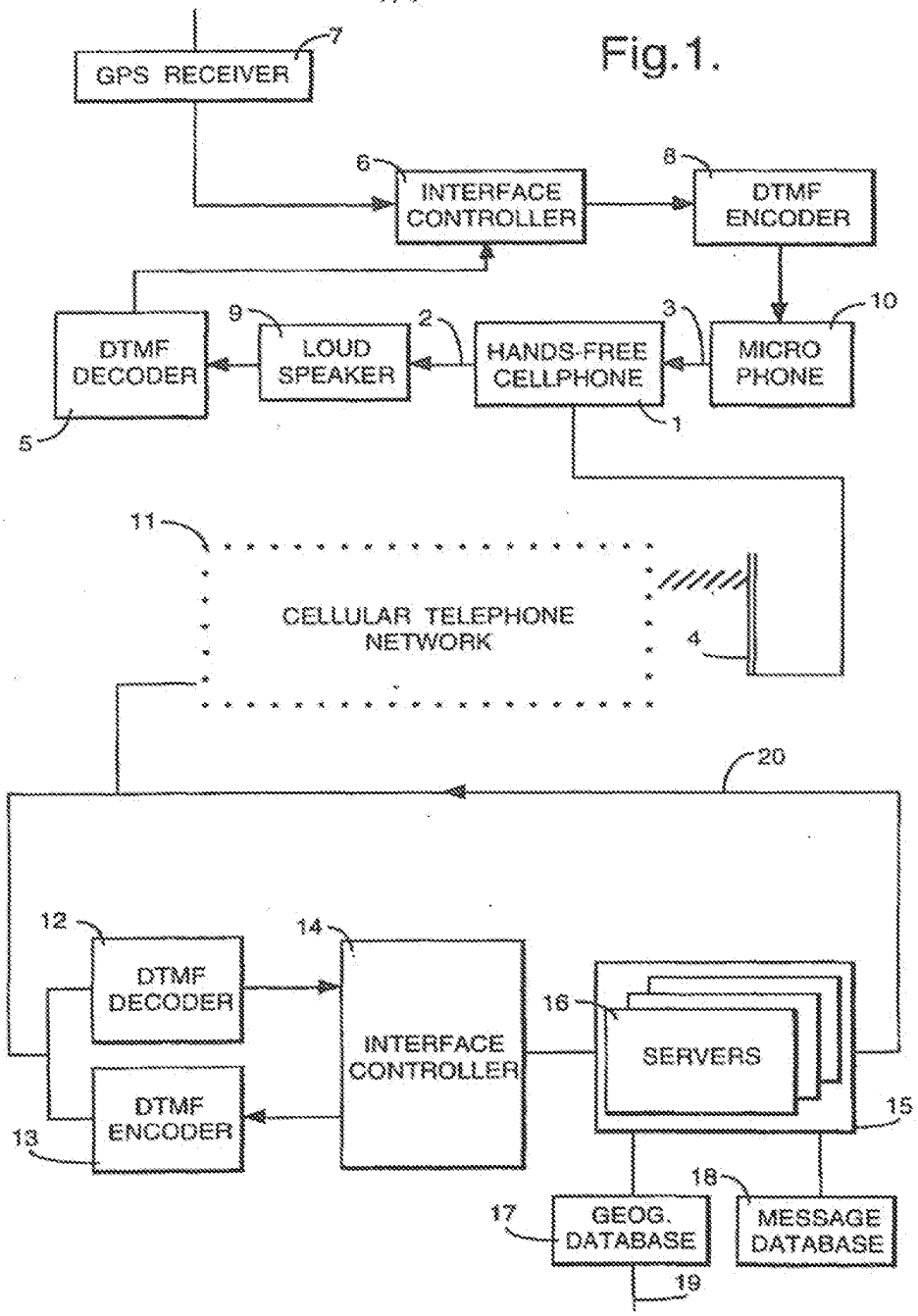

GPS RECEIVER
7
6
INTERFACE CONTROLLER
8
DTMF ENCODER
DTMF DECODER
9
LOUD SPEAKER
2
HANDS-FREE CELLPHONE
3
MICRO PHONE
10
5
1
11
CELLULAR TELEPHONE NETWORK
4
20
12
DTMF DECODER
14
INTERFACE CONTROLLER
16
SERVERS
15
DTMF ENCODER
13
18
17
GEOG. DATABASE
MESSAGE DATABASE
19

Fig.2.

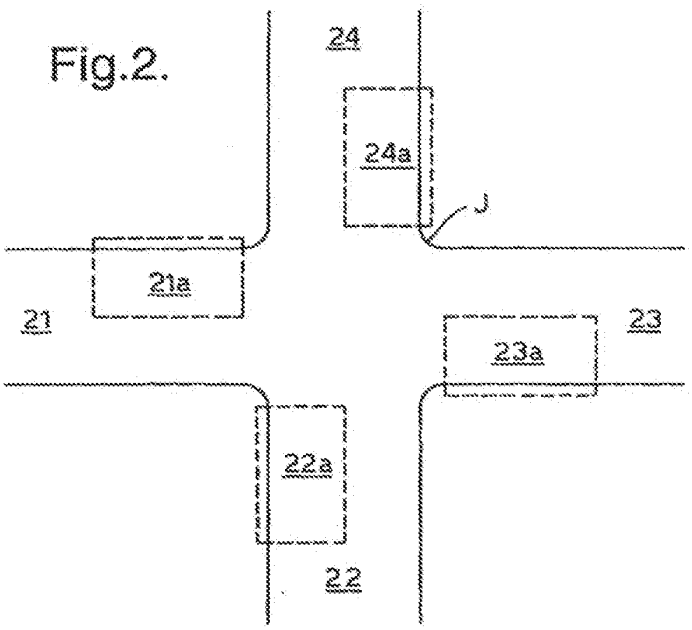

24
24a
J
21a
21
23
23a
22a
22

Fig.3.

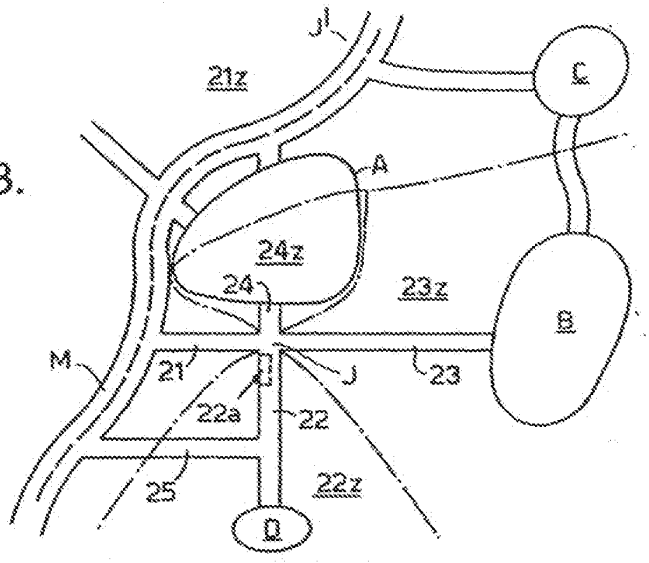

J1
21z
C
A
24z
24
23z
B
M
21
J
23
22a
22
25
22z
D

Fig.4.

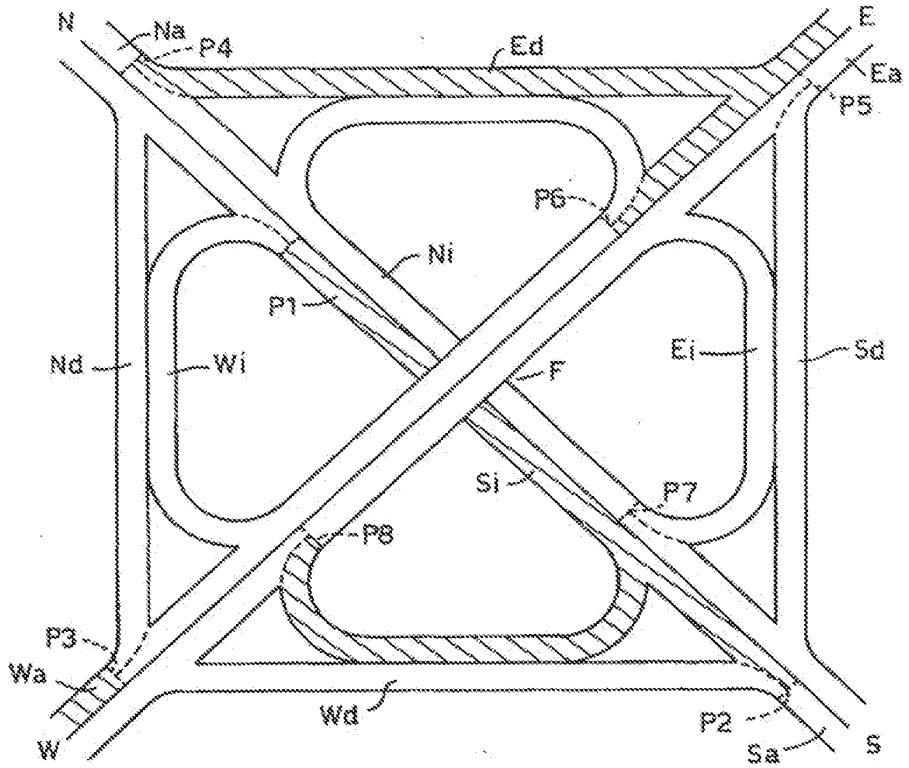


Fig.5a.

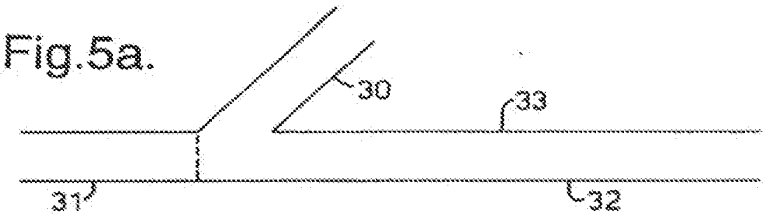


Fig.5b.

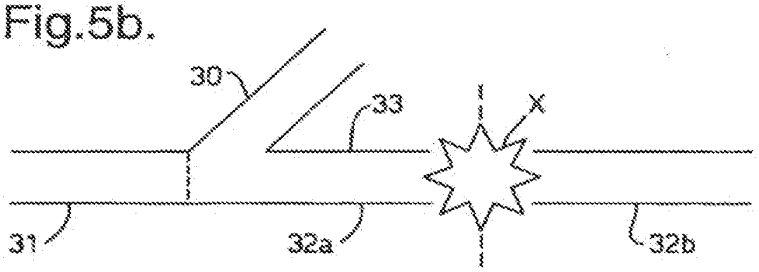
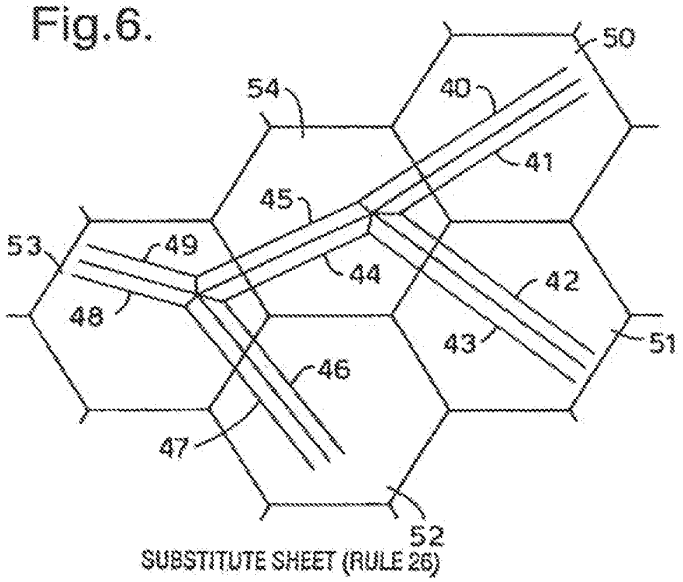


Fig.6.



INTERNATIONAL SEARCH REPORT

Interna al Application No
PCT/GB 95/02065

A. CLASSIFICATION OF SUBJECT MATTER
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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 G01S H04Q G08G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP,A,0 174 540 (GEOSTAR COOPERATION) 19 March 1986	1,7,9, 17,23, 24,30, 47,48
Y	see page 6, line 1 - page 7, line 24; figure 1	2-6,8, 10-16, 18-22, 25-29, 31,32, 38-46
Y	GB,A,2 176 964 (STC PLC) 7 January 1987 see page 1, line 63 - page 2, line 5; figure 1	8

-/--

[X] Further documents are listed in the continuation of box C. [X] Patent family members are listed in annex.

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International Application No
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	EP,A,0 379 198 (SHARP KABUSHIKI KAISHA) 25 July 1990 see page 3, line 45 - page 6, line 17; figures 1,2	2-6, 18-22 33-37
Y	EP,A,0 604 404 (CATERPILLAR INC) 29 June 1994 see page 9, line 58 - page 10, line 23 see page 11, line 13 - line 45 see page 12, line 20 - line 24 see page 18, line 16 - line 42; figures 1,3-5,7-10	10-15, 25-29, 31,32, 38-46
Y	EP,A,0 601 293 (MOTOROLA INC.) 15 June 1994 see column 8, line 14 - column 10, line 2 see column 11, line 10 - column 12, line 18; figures 1-4	16,29
A	GB,A,2 264 837 (KOKUSAI DENSHIN DENWA COMPANY LIMITED) 8 September 1993 see page 5, line 14 - page 9, line 12 see page 19, line 4 - page 23, line 15; figures 1-5	1,17, 30-32, 47,48
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Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

Internat. Application No
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Patent document cited in search report	Publication date	Patent family member(s)		Publication date
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		CA-A-	1249033	17-01-89
		JP-A-	61112439	30-05-86
GB-A-2176964	07-01-87	NONE		
EP-A-0379198	25-07-90	JP-A-	2189488	25-07-90
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(54) Title: DRIVER CONTROL INTERFACE SYSTEM

(57) Abstract

A driver control interface controls the values of a plurality of features in a vehicle and displays information from the vehicle to the driver. A plurality of feature group switches are located on the steering wheel of the vehicle. Each of the vehicle features is associated with a feature group. Each of the feature group switches activates an associated feature group. A plurality of selection switches is also preferably located on the steering wheel for adjusting the values of the features associated with the activated feature group. An eyes-front display indicates the current value of a feature in an activated feature group.

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DRIVER CONTROL INTERFACE SYSTEM

BACKGROUND OF THE INVENTION

This invention relates to a driver control interface for a vehicle.

Technology available in current vehicles has been rapidly increasing. As a result, the amount of information supplied to the driver and amount of input required from the driver has also been increasing.

Current vehicles typically include radios with cassette or compact disc players, advanced climate control systems with air conditioning and purification abilities, on-board navigational systems which operate in conjunction with global positioning satellites, collision avoidance systems, automobile self-diagnostic systems, cellular phones, pagers, rearview camera systems, radar detectors, anti-theft systems and remote controls.

Each additional system raises several concerns. First, all of the input and output interfaces for each of these systems must be located within the vehicle in an aesthetically acceptable manner. Second, the time and distance that the driver's attention is diverted from the road must be minimized, as should the time and distance that a driver's hands are diverted from the steering wheel while operating each of these systems. Further, as the complexity of systems in vehicles increases, the interface must be more user friendly so that all drivers can benefit from these systems.

SUMMARY OF THE INVENTION

The present invention provides a "hands-on", "eyes-front" driver control interface system which minimizes the time and distance that the driver's attention is diverted from the road and the time and distance that the driver's hands are

diverted from the steering wheel while operating various systems in the vehicle. The vehicle includes a plurality of feature groups, such as audio, climate, etc., each having a plurality of associated features such as volume, balance, tuning, temperature, fan speed, etc. Each of these features has an associated value which is adjustable by the driver. Other features have a value which is only communicated to the driver for information purposes, such as engine temperature, tachometer, fuel level, speed, etc.

A high-resolution, reconfigurable display is located on the instrument panel directly in front of the steering wheel in an "eyes-front" position, i.e., the driver's focus need only be diverted slightly downward from the road.

The driver control interface system includes a plurality of feature group switches located on the vehicle steering wheel such that they are within reach of the driver's fingertips on one hand while the driver's hand is located comfortably in a normal position on the steering wheel ("hands-on"). Each of the feature group switches selectively activates one of the feature groups. The display indicates the currently-activated feature group and indicates the current value of features in the activated feature group.

A plurality of selection switches are also located just inside the periphery of the steering wheel adjacent a normal position of the driver's opposite hand ("hands-on"). The selection switches activate features within the activated feature group and adjust the values of the activated feature. Preferably, an enlarged graphic representing the activated feature appears upon activation of the feature. The driver control interface system includes control circuitry for implementing the adjusted

value of the activated feature in the vehicle and for retrieving the information for the features in the activated feature group.

The driver control interface system can be customized and personalized. The driver selects a subset of the features in the vehicle to control from the steering wheel by assigning feature groups to the feature group switches. Further, the driver can change the colors, backgrounds, and information displayed for the feature groups. The driver control interface system continuously provides help to the driver for operating the various features.

A large number of features are operated by the driver of the vehicle without repositioning the driver's hands on the steering wheel. Further, the driver's attention is not diverted significantly from the road while adjusting the values of the features or receiving information from the display.

BRIEF DESCRIPTION OF THE DRAWINGS

The above, as well as other advantages of the present invention, will become apparent to those skilled in the art from the following detailed description of a preferred embodiment when considered in light of the accompanying drawings in which:

Figure 1 illustrates a preferred embodiment of the present invention;

Figure 2a illustrates an alternate embodiment of the function group switches shown in Figure 1;

Figure 2b illustrates another alternate embodiment of the function group switches of Figure 1;

Figure 2c illustrates an alternate embodiment of the select switches of Figure 1;

Figure 3 illustrates the display of Figure 1 with an activated audio feature group;

Figure 4 illustrates the display of Figure 1 with an activated audio volume feature;

Figure 5 illustrates the display of Figure 1 with an activated climate feature group;

Figure 6 illustrates the display of Figure 1 with an activated cruise control feature;

Figure 7a illustrates the display of Figure 1 with an activated navigational feature;

Figure 7b illustrates the display of Figure 7a with an enlarged, three-dimensional navigational feature;

Figure 8 illustrates the display of Figure 3 with a superimposed warning message;

Figure 9a illustrates the optional center touch screen of Figure 1 in a first mode;

Figure 9b illustrates the optional center touch screen of Figure 9a with an activated audio feature group;

Figure 9c illustrates the optional center touch screen of Figure 9a in a third mode;

Figure 9d illustrates the optional center touch screen of Figure 9c with an activated cellular phone feature group;

Figure 10 illustrates the display of Figure 1 with an activated collision avoidance feature;

Figure 11 illustrates the display of Figure 1 with an activated diagnostic feature;

Figure 12a is a schematic of circuitry which can be used to implement the driver control interface system of Figure 1 in a vehicle;

Figure 12b is an alternate schematic for implementing the driver control interface system of the present invention in a vehicle.

Figure 13a is another alternate schematic for implementing the driver control interface system of the present invention in a vehicle;

Figure 13b is another alternate schematic for implementing the driver control interface system of the present invention in a vehicle.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to Figure 1, a driver control interface system 20 according to a preferred embodiment of the present invention, includes a display 22 which is preferably a high-resolution, reconfigurable display. Preferably a liquid crystal display or a electro-luminescent display is used. The display 22 is located on the instrument panel 24 directly in front of the steering wheel 26 in an "eyes-front" position, i.e., the driver's focus need only be diverted slightly downward from the road to view the display. Further, while the driver is looking at the display 22, the driver's peripheral vision will still somewhat include the road in front of the vehicle. Alternatively, the display 22 could be a heads-up display, projected onto the windshield in front of the driver such that the driver need only focus his eyes far ahead to view the traffic or upon the windshield to see the displayed information.

Preferably a plurality of feature group switches 28 are located just inside the periphery of the steering wheel 26 such that they are within reach of the fingertips

of one of the driver's hands while located comfortably in a normal position on the steering wheel 26 ("hands-on"). In this example, the feature group switches 28 would include an audio group switch 28a, a climate group switch 28b, a navigation group switch 28c, a cruise control switch 28d a cruise control off switch 28e, and a configure switch 28f.

Preferably a plurality of select switches 30 are also located just inside the periphery of the steering wheel 26 adjacent a normal position of the driver's opposite hand ("hands-on"). The select switches 30 preferably include an up arrow switch 30a, a select switch 30b, and a down arrow switch 30c. As an alternative to the switches 28, the driver control interface system 20 may also include a center touch screen 32, which will be discussed in more detail later.

As shown in Figure 2a, the feature group switches 28 could alternatively be located adjacent a group switch display 34. The group switch display 34 is a reconfigurable display which graphically indicates the current function of each of the feature group switches 28. The functions of each of the feature group switches 28 and the graphic indications in the group switch display 34 change to be personalized for each operator and change as appropriate based upon the user's previous selections to provide a series of menus and sub-menus. For example, upon activating the hard audio group switch 28a in Figure 2a, hard switch 28a is subsequently reconfigured to activate the volume feature. The group switch display 34 is simultaneously reconfigured accordingly to indicate that switch 28a would select the volume feature.

Alternatively, the feature group switches 28 could be replaced with a feature group switch touch screen 36, shown in Figure 2b. The feature group touch screen

36 is a reconfigurable, high-resolution, touch-sensitive screen which graphically indicates areas of the screen 36a-f which represent the feature group switches 28a-f. The feature group switches 28a-f are activated by touching the graphical representations 36a-f of the feature group switches 28a-f. The feature groups associated with the feature group switches 28 can be personalized through the use of an external input board or through on-screen menus which are accessed by activating the configure switch 28f. Further, the functions performed by the feature group switches 28 can change based upon the user's previous selections, e.g. after activation of the audio group switch 28a, the touch screen 36 would be reconfigured into feature switches for selecting audio features within the audio feature group.

The select switches 30 could alternatively be a mouse 31, shown in Figure 2c. The mouse 31 includes an up switch 31a, down switch 31c, left switch 31d, right switch 31e, and center select switch 31f. The mouse 31 provides efficient control over a large number of features.

Referring to Figure 3, the display 22 is preferably graphically divided into a first portion 38 and a second portion 40. In this example, the first portion 38 is generally the left half of the display 22 and the second portion 40 is generally the right half of the display 22. Figure 3 illustrates one way of maintaining the speedometer graphic 42, fuel graphic 44, and odometer 45 at all times. Alternatively, the speedometer 42, fuel 44 and odometer 45 could be located in a separate display, or could be temporarily reduced or eliminated so that the second portion 40 covers the entire display 22. However, it is currently required by federal regulations that the speedometer 42, fuel 44, and odometer are displayed to the driver at all times.

The first portion 38 preferably includes a help graphic 48 which provides continuous instructions to the driver for operating the driver control system interface 20. Figure 3 illustrates the display 22 after the driver has activated the audio group switch 28a, thereby activating the audio group graphic 50. The active audio group graphic 50 includes inactive audio feature graphics for each audio feature which indicate the current value of those audio features. For example, the active audio group graphic 50 includes an inactive volume graphic 52 which indicates the current value of the volume feature. The inactive tuning graphic 54 indicates the current frequency 56 and the current pre-set station selected 58. The inactive balance graphic 60 indicates the current value of the balance feature between the left and right speakers. The inactive fade graphic 62 indicates the current value of the fade feature between the front and back speakers. The inactive equalization graphics 64a-e indicate the current values for each of the frequency bands of the equalizer.

After pressing the audio group switch 28a to activate the audio group graphic 50 as shown in Figure 3, the driver then presses the select switch 30b to activate the first audio feature within the audio feature group, in this case, volume. This produces in the active volume graphic 66, as shown in Figure 4, which is preferably magnified within the second portion 40 of the display 22. While the volume graphic 66 is in its active mode, the driver can adjust the value of the volume feature up or down by pressing the up arrow switch 30a or down arrow 30c, respectively. The value of the volume feature is continuously displayed by the active volume graphic 66.

The subsequent activation of the select switch 30b activates the next audio feature within the audio feature group, in this case the tuning feature. Preferably,

the subsequent activation of the up arrow 30a or down arrow 30c would cycle the tuner through the pre-set stations previously selected by the user. Subsequent activations of the select switch 30b would sequentially activate the other audio features such as balance, fade, and each of the equalization bands, the value of which could each be adjusted up or down by activation of the up arrow switch 30a and down arrow switch 30c.

At any time, the driver can activate any of the other feature group switches 28 to activate a different feature group. For example, Figure 5 shows the display 22 upon the activation of the climate group switch 28b. The active climate group graphic 68 would preferably occupy the second portion 40 of display 22. The active climate group graphic 68 would indicate the current values of each of the climate features such as driver temperature 70, passenger temperature 72, driver fan speed 74, passenger fan speed 76, driver air flow 78, and passenger air flow 80. Subsequent activation of the select switch 30b sequentially activates the climate features. The activated climate feature graphic may be magnified as demonstrated for the audio feature graphics, but preferably the climate feature graphics are highlighted or displayed in a different color from the inactive climate features. This is indicated in Figure 5 by the dashed lines surrounding the driver temperature graphic 70. After activating a selected climate feature, the user can adjust the value of that climate feature by pressing the up arrow 30a or down arrow 30c. The driver can sequentially activate the climate features by pressing the select switch 30b or the driver can select another feature group by pressing a feature group switch 28.

Figure 6 shows the active cruise control graphic 82 after activation of the cruise feature switch 28d. The setting of the cruise control feature can be adjusted

by pressing the up arrow 30a or down arrow 30b. The cruise control feature can be turned off at any time by activating the cruise off switch 28e.

Figure 7a illustrates the display 22 after activating the navigation group switch 28c. Figure 7a shows the active navigation graphic 86 in two-dimensional mode. The active navigation graphic 86 preferably occupies substantially the entire display 22, but a reduced speedometer graphic 88 and a reduced fuel level graphic 90 are displayed at all times. The active navigation graphic 86 generally displays the current location of the vehicle relative to a map of the surrounding area based upon information from a global positioning satellite combined with map information stored on an on-board CD-ROM player or other large storage device, the odometer, a compass and other information. The required navigation systems are currently commercially available. An instruction graphic 92 includes navigational instructions to the driver derived from the map in the on-board computer, information from the global positioning satellite, and the desired destination as indicated by the driver. The help graphic 48 is also displayed with the active navigation graphic 86. The help graphic 48 indicates to the driver instructions for accessing the different features of the navigation feature group. For example, by pressing the up arrow 30a or down arrow 30c, the driver can zoom in or out of the displayed map. For example, the driver can access a state map or a more local map. Further, by activating the select switch 30b, the user can switch to the "three-dimensional" display. The display 22 as shown in Figure 7b shows the active navigation graphic 86 zoomed in from Figure 7a and shown in "three-dimensional" mode. Preferably, in three-dimensional mode, the driver control interface system 20 transforms the two-dimensional data from the maps on the navigational CD-ROM to a simulated

three-dimensional, perspective view. This feature will assist many drivers in visualizing their location on the map.

As shown in Figure 8, any urgent information regarding the operation of the vehicle is preferably displayed in a warning graphic 98 which is superimposed over the current activated graphic, which, in this example is the active audio group graphic 50. The superimposed warning graphic 98 could be displayed for a predetermined length of time or until the driver acknowledges having seen the warning by pressing a feature group switch 28.

The center touch screen 32 is shown in more detail in Figure 9a. The center touch screen 32 is preferably a high-resolution, reconfigurable, touch-sensitive screen located on the steering wheel 26. In Figure 9a, the center touch screen 32 is shown displaying graphic representations 100a-f of the feature group switches 28a-f. The driver can activate the feature group switches 100a-f by touching the center touch screen 32 at the location of the graphical feature group switches 100a-f. These feature group switches 100a-f can activate the associated feature groups on display 22 as described above. Alternatively, activation of a switch 100a-f on the center touch screen 32 can initiate a reconfiguration of the center touch screen 32 into another set of graphical switches. For example, upon activating the audio feature group switch 100a on center touch screen 32, center touch screen 32 is reconfigured as shown in Figure 9b. In this configuration, the center touch screen 32 would include graphical audio feature switches for volume 102a, balance 102b and tuning 102c. The touch screen 32 in Figure 9b also includes a plurality of graphical switches 102d for operating a CD player.

Alternatively, activation of the switches 100a-f initiates a reconfiguration of the switches 28a-f. For example, activation of the audio switch 100a on the center touch screen causes the switches 28a-f to be reconfigured to activate the audio features such as volume, balance, etc. It should be apparent that the center touch screen 32 could also be located at the upper portion of the steering wheel 26 and could alternatively comprise a plurality of hard switches, or a combination of hard switches with a reconfigurable display, rather than a touch screen.

The center touch screen 32 can also be reconfigured as shown in Figure 9c to include a different sub-set of the available feature groups in a vehicle, such as navigation 104a, collision avoidance 104b, diagnostic 104c, cellular phone 104d, and rearview camera 104e. By pressing the cellular phone feature group switch 104d, the driver activates the cellular phone graphic 106 as shown in Figure 9d on center touch screen 32. The activated cellular phone group graphic 106 preferably includes several graphical buttons 108 for previously stored telephone numbers, as well as a graphical send button 110 and a graphical end button 112.

Activation of the collision avoidance feature group switch 104b activates the collision avoidance graphic 114 as shown in Figure 10, which occupies generally the second portion 40 of the display 22. The collision avoidance system incorporates ultrasound, acoustic, radio frequency ("RF"), infrared ("IR"), LED or laser systems to provide the typical driver with additional information pertaining to the "blind spots" and to assist trucks in backing up without a mishap. These systems are also commercially available.

Referring to Figure 11, diagnostic information can be displayed by activating the diagnostic feature group button 104c on center touch screen 32 from Figure 9c.

The activated diagnostic graphic 116 displays maintenance needs, including oil change, tire rotation and brake pads.

Figure 12a illustrates one possible schematic for implementing the values adjusted by the driver and for retrieving information to be displayed to the driver on the driver control system interface 20. The feature group switches 28 and select switches 30 are input to a CPU 120 which operates the display 22. The CPU 120 is also connected to the vehicle's main bus 122. The main bus 122 preferably carries information and commands for numerous vehicle components, including speed, engine operating information, climate control, audio and other electronic systems, etc. Any other systems, for example the navigational system 124, which do not operate on the vehicle main bus 122, are connected directly to the CPU 120.

Figure 12b illustrates an alternative schematic for implementing the driver control interface system 20. The switches 28, 30 are connected via a local bus interface 125 to the bus 126 which carries the signals to the CPU 120. The CPU 120 operates the display 22 and receives information from the navigational system 124. An input device 127, such as a keyboard, mouse, etc., to be accessible by both the driver and passenger is also connected via a local bus interface 128 to the bus 126 which carries signals to the CPU 120.

Figure 13a illustrates another schematic for implementing the driver control interface system 20. In this embodiment, the display 22 and switches 28, 30 are connected to a CPU 130. The CPU 130 is connected via a multiplexer 134 and demultiplexer 136 to an auxiliary controller 138. The auxiliary controller 138 controls non-safety, non-critical functions, such as climate control, audio, etc. and receives information from the engine control unit 140 and from the navigational

system 142. The controller 138 sends and receives commands and information related to most of the vehicle features from the main vehicle bus 144, such as audio, climate, speed, fuel, temperature, etc. The driver control interface system 20 is preferably a redundant or secondary interface. There is preferably a main interface 146 that is shared with the passenger of the vehicle. The main interface 146 includes a display 148 and an input device 150, such as a keyboard, mouse or touch screen. The main interface 146 operates all of the vehicle features and preferably contains a menu for personalizing the driver control interface system 20.

Figure 13b illustrates another schematic which could be used to implement the driver control interface system 20. The feature group switches 28 and select switches 30 are located on the steering wheel 26 and are connected via a local bus interface 152 to a bus 154 which carries signals to a controller 156. The local bus interface 152 also retrieves graphics and text from a video image library 158 for display on the center touch screen 32. The video image library 158 may also contain graphical information for display on the feature group display 34 or the feature group touch screen 36, if available. The controller 156 receives information from the engine control unit 140 and the navigational system 142. The controller 156 also drives the display 22 and the display 148 for the main interface 146 and receives commands from the main interface input device 150.

Preferably, the driver control interface system 20 can be personalized several ways. As discussed above, the feature groups associated with the feature group switches 28 is preferably a user-definable subset of the available set of feature groups in the vehicle. Further, the active and inactive graphics for each feature group and feature can preferably be personalized as well. For example, some

drivers may prefer gauges for the vehicle functions such as oil pressure, engine temperature, alternator, tachometer, etc., while other drivers prefer simple warning lights which only appear when there is a problem with the vehicle function. Further, the backgrounds, colors, styles, sizes, fonts of the graphics can be selected for the particular driver. These features are preferably customized using the main interface 146 or an external input board 152 (shown in dashed lines) which connects to the CPU 130 for the driver control interface system 20. The input board would be available at automobile dealerships. The features could alternatively be customized as described above by providing a configuration feature group switch 28f as shown in Figure 1 which would initiate a series of menus and sub-menus for personalization.

The controls and systems for implementing the changes directed by the inventive interface systems are known by one of ordinary skill in the art. It should be apparent that the steering wheel 26 is shown for illustrative purposes only and it is contemplated that vehicles might have alternative directional input devices. For example, the auto industry is currently investigating "drive-by-wire" systems which could utilize joysticks or other electronic input devices by which the driver could steer the vehicle. In order to achieve the safety and convenience benefits as described above, the driver should not be required to significantly reposition his hands from the directional input device while interfacing with the driver control interface 20.

In accordance with the provisions of the patent statutes, the present invention has been described in what is considered to represent its preferred embodiment.

However, it should be noted that the invention can be practiced otherwise than as specifically illustrated and described without departing from its spirit or scope.

WHAT IS CLAIMED IS:

1. A driver control interface for controlling the values of a plurality of user-adjustable features in a vehicle, said driver control interface comprising:

a directional input device;

a plurality of feature group switches located on said directional input device, each said feature being associated with a feature group, said feature group switches selectively activating said feature groups;

a plurality of selection switches located on said directional input device, said selection switches adjusting the values of said features associated with said activated feature group;

a display displaying an activated feature group, said display indicating the current value of a feature in said activated feature group;

control circuitry for implementing said adjusted value of said activated feature in said vehicle.

2. The driver control interface of Claim 1 wherein said selection switches selectively activate a feature from said activated feature group, said selection switches selectively adjusting the value of said activated feature.

3. The driver control interface of Claim 1 wherein each said feature group switch activates one of said feature groups.

4. The driver control interface of Claim 3 wherein said plurality of feature group switches activate a user-definable subset of said feature groups.

5. The driver control interface of Claim 1 wherein said plurality of selection switches sequentially activates said features associated with said activated feature group.

6. The driver control interface of Claim 5 wherein said selection switches adjust the value of said activated feature.

7. The driver control interface of Claim 1 wherein said display displays a first graphic for each feature in said activated feature group when said feature is not activated and a second graphic for each feature in said activated feature group when said feature is activated.

8. The driver control interface of Claim 1 wherein said feature group switches are provided on a touch-sensitive screen.

9. The driver control interface of Claim 8 wherein said touch sensitive screen is reconfigurable to display an activated feature group, and also to provide said selection switches.

10. The driver control interface of Claim 1 further including a feature group switch display adjacent said plurality of feature group switches, said feature group switch display indicating the feature group associated with each said feature group switch.

11. The driver control interface of Claim 10 wherein said switch display is reconfigurable to display selection switches for an activated feature group.

12. The driver control interface of Claim 1 wherein said selection switches allow selection of one feature in said feature group for adjustment.

13. The driver control interface of Claim 12 wherein said selected one feature is enlarged on said display after selection.

14. The driver control interface of Claim 1 wherein said display is an eyes-front display.

15. The driver control interface of Claim 14 wherein directional input device is a steering wheel, said display located in front of said steering wheel.

16. The driver control interface of Claim 15 wherein said display is located on an instrument panel of the vehicle.

17. A driver control interface for controlling the values of a plurality of user-adjustable features in a vehicle, each said feature being associated with a feature group, said driver control interface comprising:

a) a steering wheel in said vehicle;

b) a display positioned forward of said steering wheel;

c) means for selectively activating a feature group on said display;

d) means for activating a feature from said activated feature group on said display;

e) means for adjusting a value of said activated feature; and

f) means for implementing said adjusted value of said activated feature in said vehicle.

18. The driver control interface of Claim 17 wherein said elements c-e are located on said steering wheel.

19. The driver control interface of Claim 17 wherein said element c) comprises a plurality of switches.

20. A driver control interface for controlling the values of a plurality of user-adjustable features in a vehicle, said driver control interface comprising:

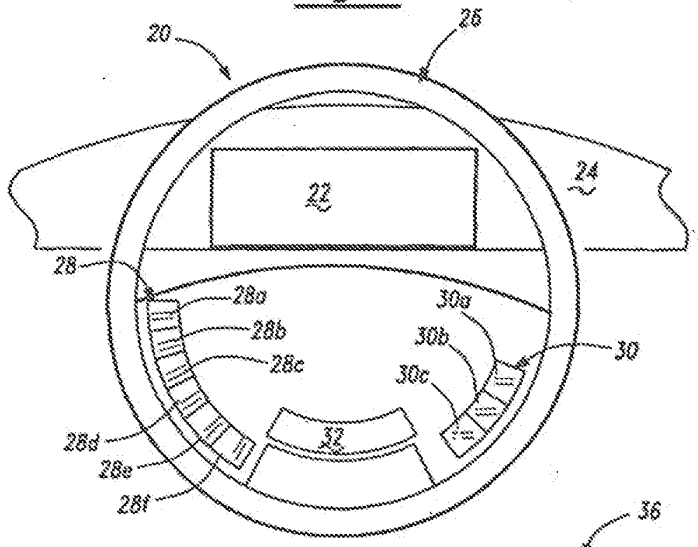
a steering wheel;

a plurality of feature group switches adjacent the periphery of said steering wheel, each said feature being associated with a feature group, each of said feature group switches selectively activating one of said feature groups;

a plurality of selection switches adjacent the periphery of said steering wheel, said selection switches selectively activating a feature from said activated feature group, said selection switches selectively adjusting the value of said activated feature; and

a display located directly forward of said steering wheel, said display displaying an activated feature group, said display indicating the current value of a feature in said activated feature group.

Fig-1



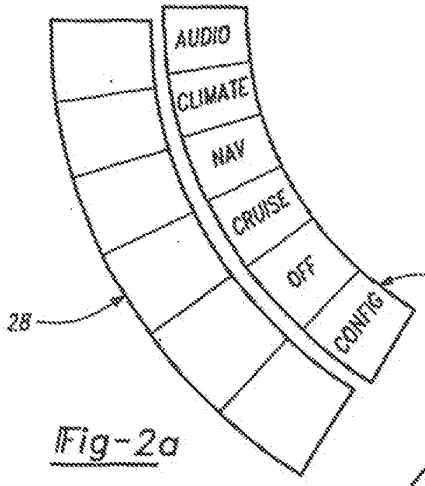


Fig-2a

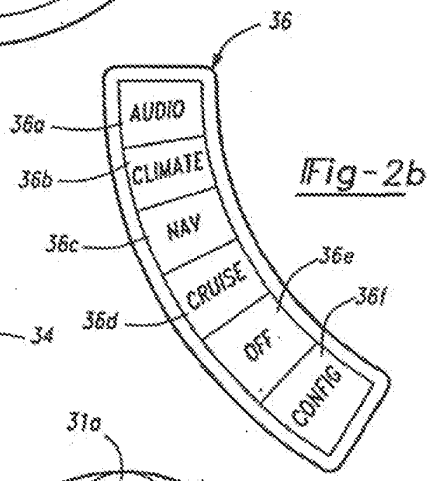


Fig-2b

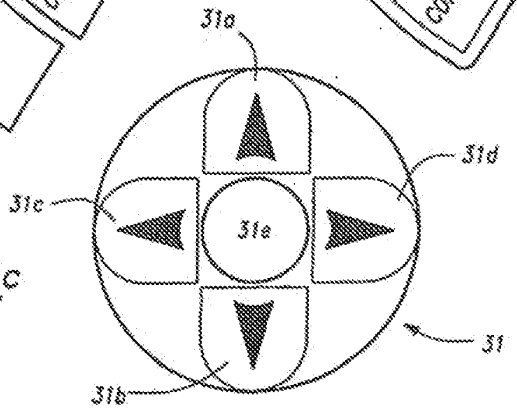


Fig-2c

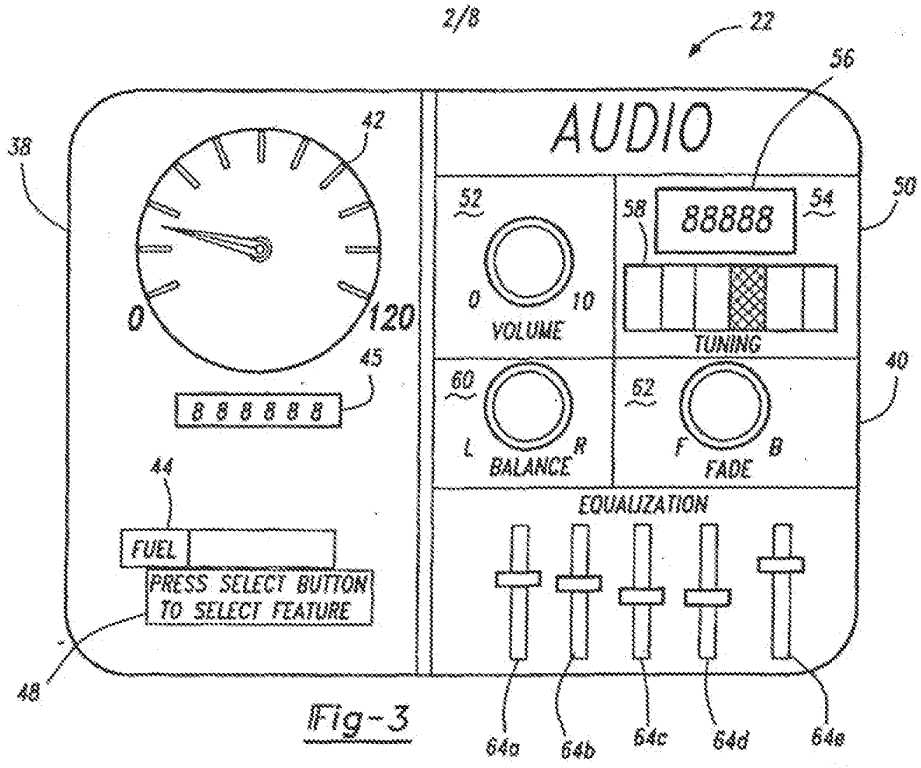

22
56
AUDIO
38
42
52
58
88888
54
50
0
120
0
10
VOLUME
TUNING
45
60
62
40
888888
L
R
BALANCE
F
B
FADE
44
EQUALIZATION
FUEL
PRESS SELECT BUTTON
TO SELECT FEATURE
48
64a
64b
64c
64d
64e

Fig-3

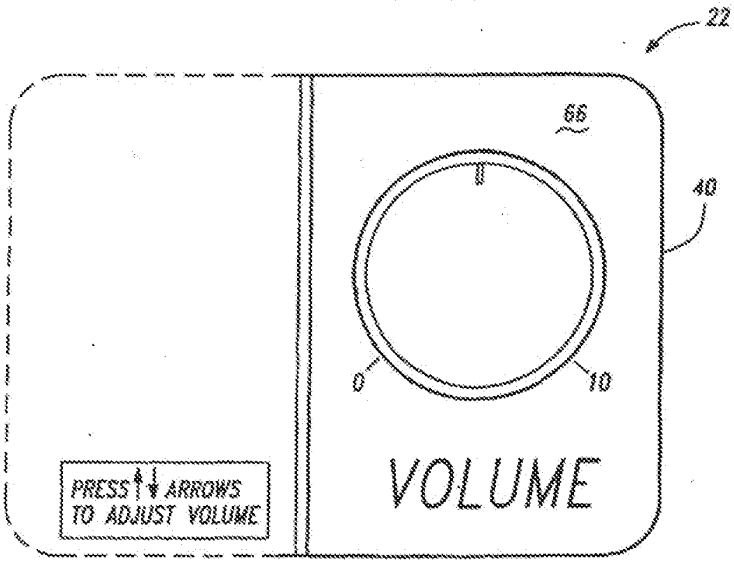

22
66
40
0
10
PRESS ↑↓ ARROWS
TO ADJUST VOLUME
VOLUME

Fig-4

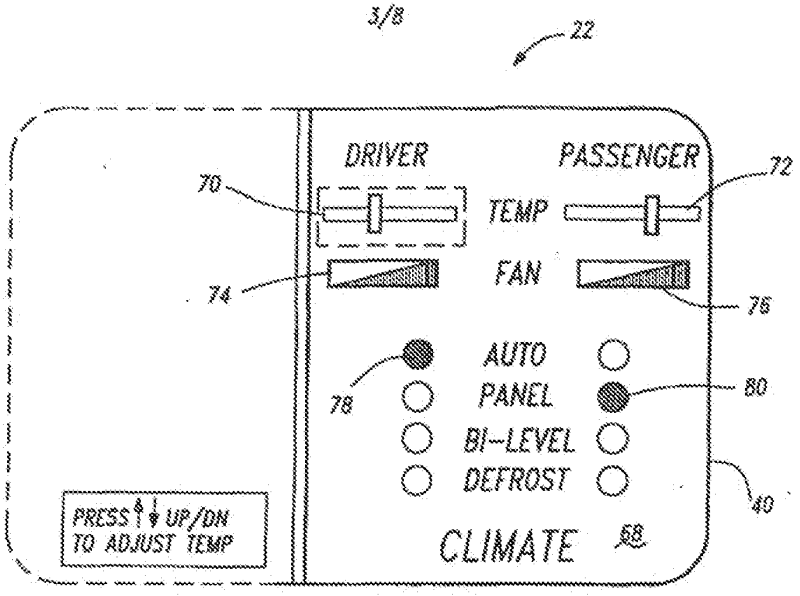

22
DRIVER
PASSENGER
70
72
TEMP
74
FAN
76
AUTO
78
PANEL
80
BI-LEVEL
DEFROST
40
PRESS UP/DN TO ADJUST TEMP
CLIMATE
68

Fig-5

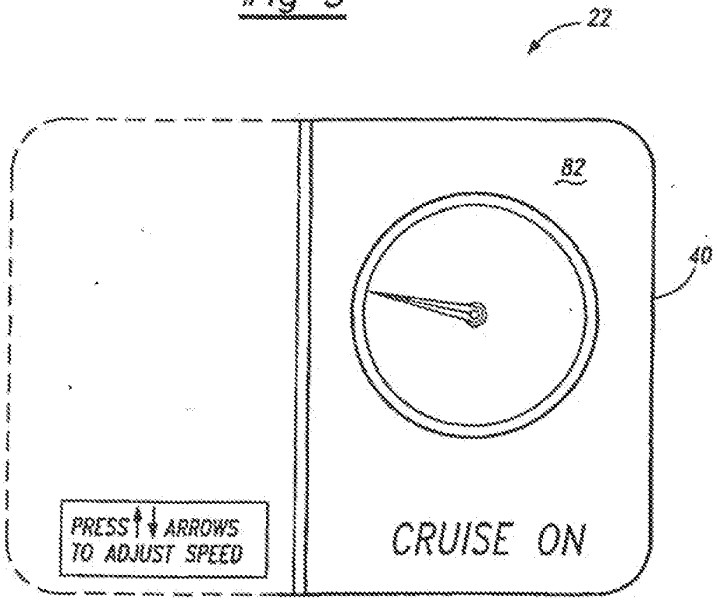

22
82
40
PRESS ARROWS TO ADJUST SPEED
CRUISE ON

Fig-6

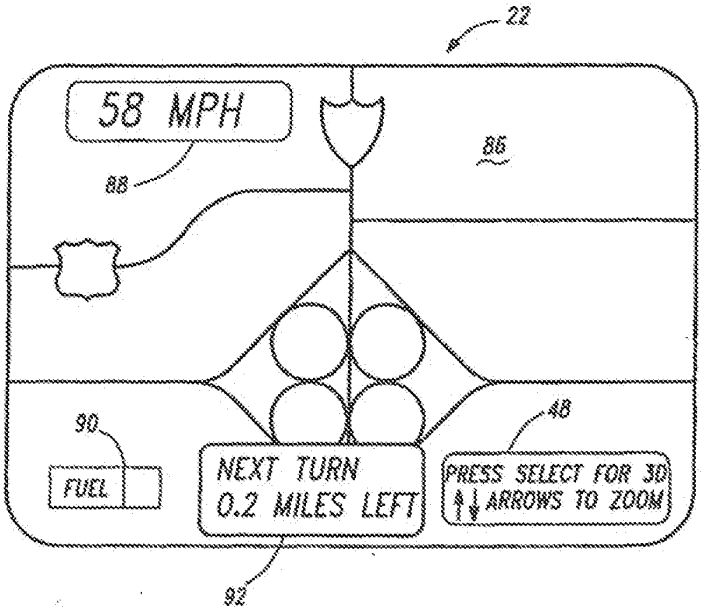

22
58 MPH
88
86
90
FUEL
NEXT TURN
0.2 MILES LEFT
48
PRESS SELECT FOR 3D
ARROWS TO ZOOM
92

Fig-7a

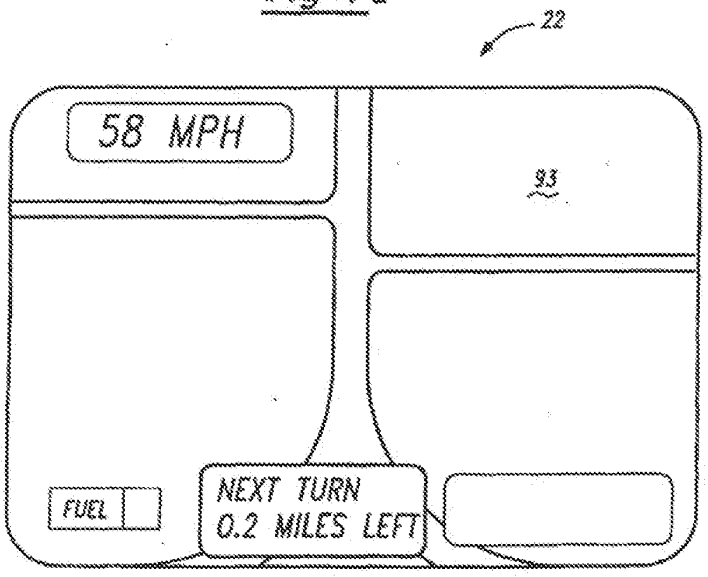

22
58 MPH
93
FUEL
NEXT TURN
0.2 MILES LEFT

Fig-7b

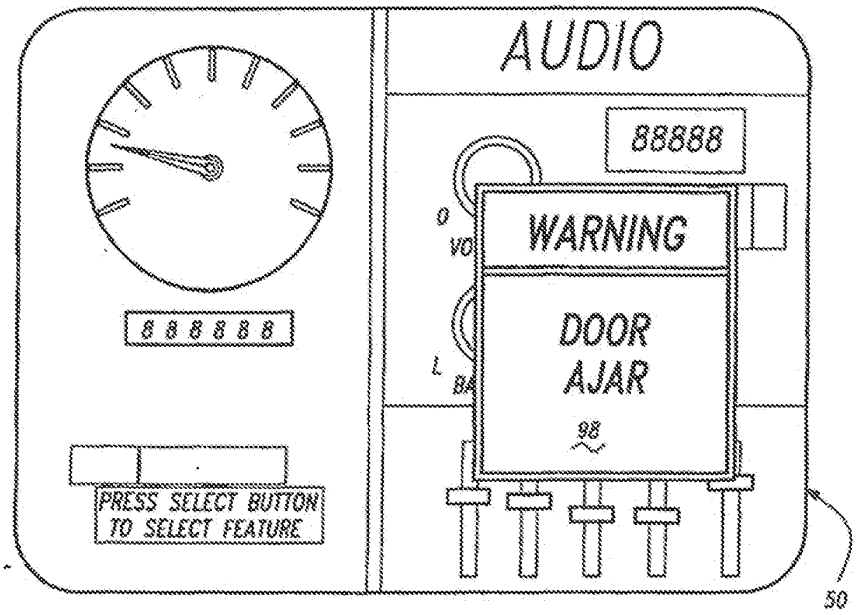


Fig-8

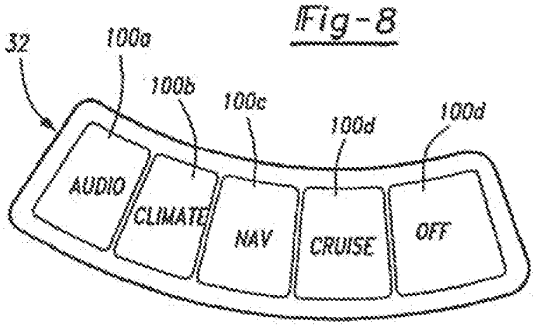


Fig-9a

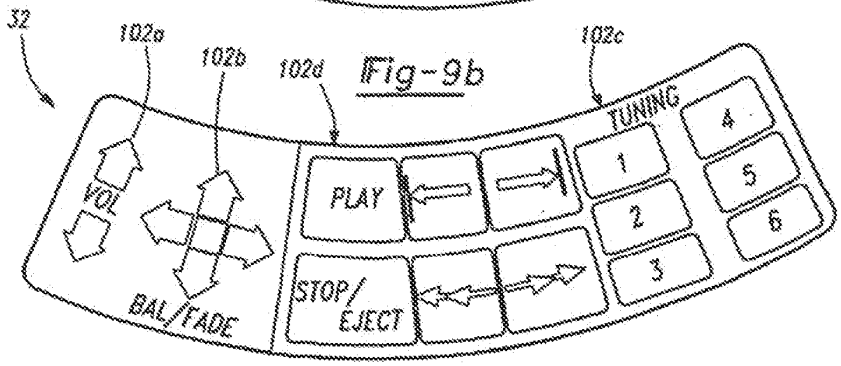


Fig-9b

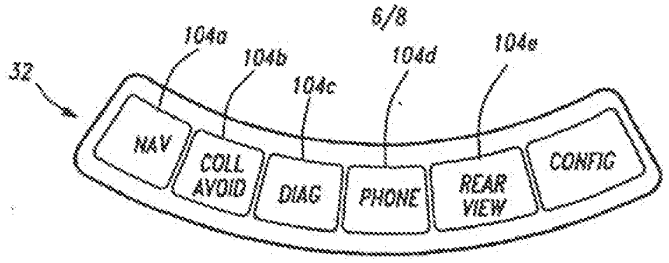


Fig-9c

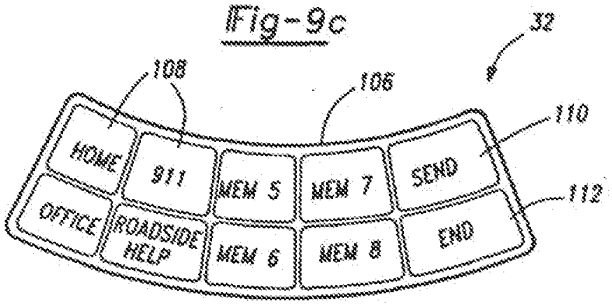


Fig-9d

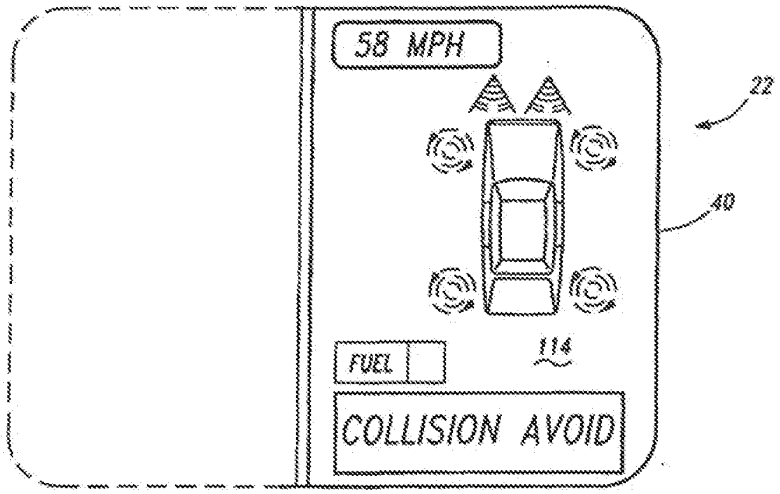


Fig-10

Fig-11

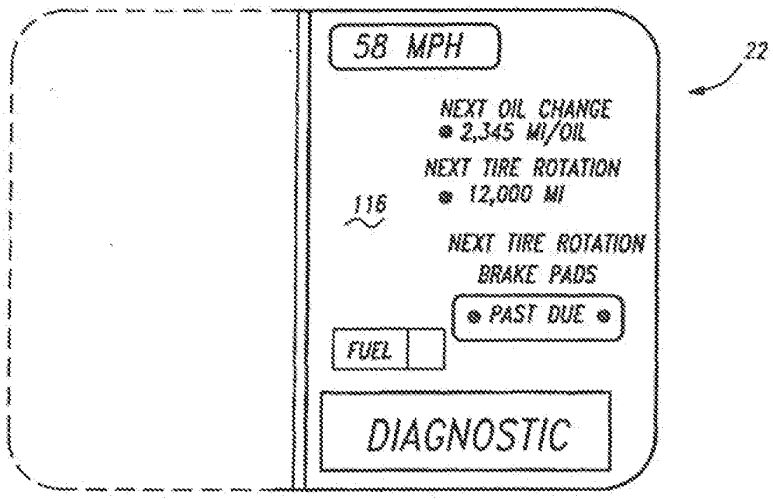


Fig-12a

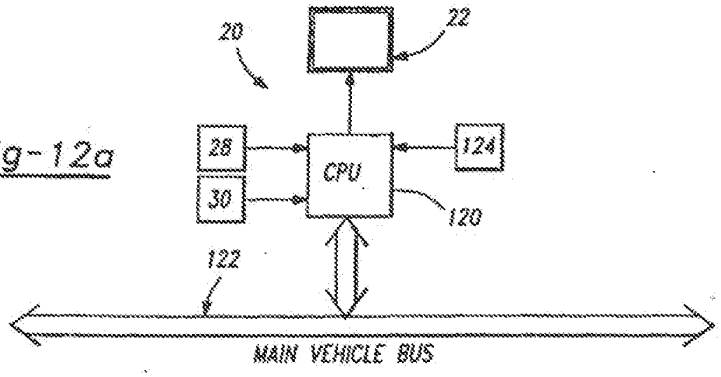
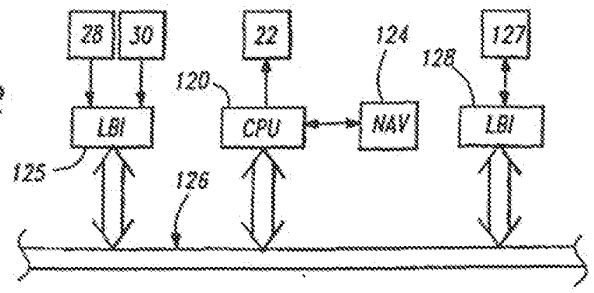


Fig-12b



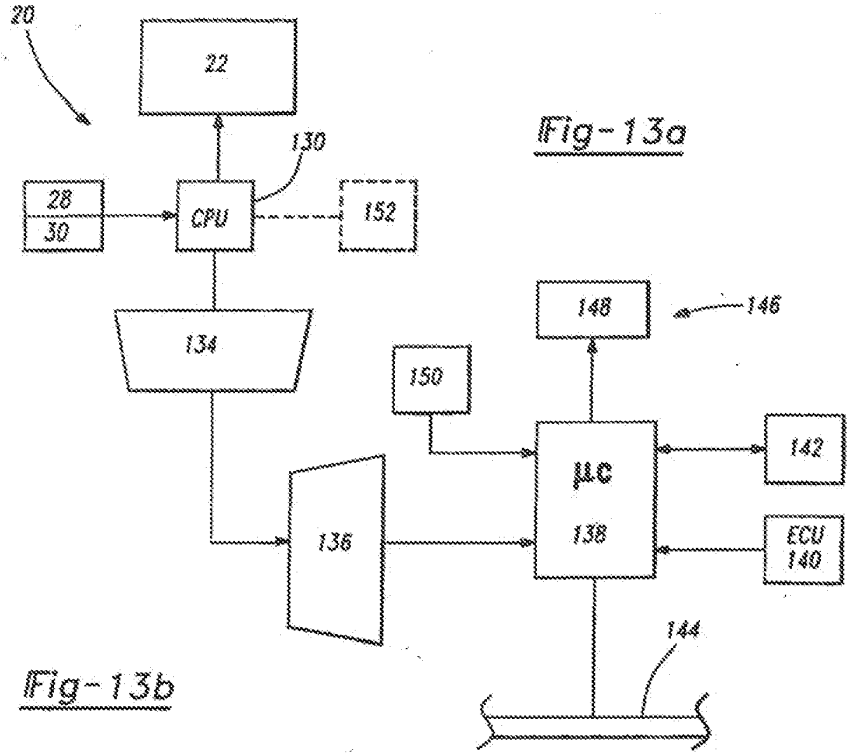
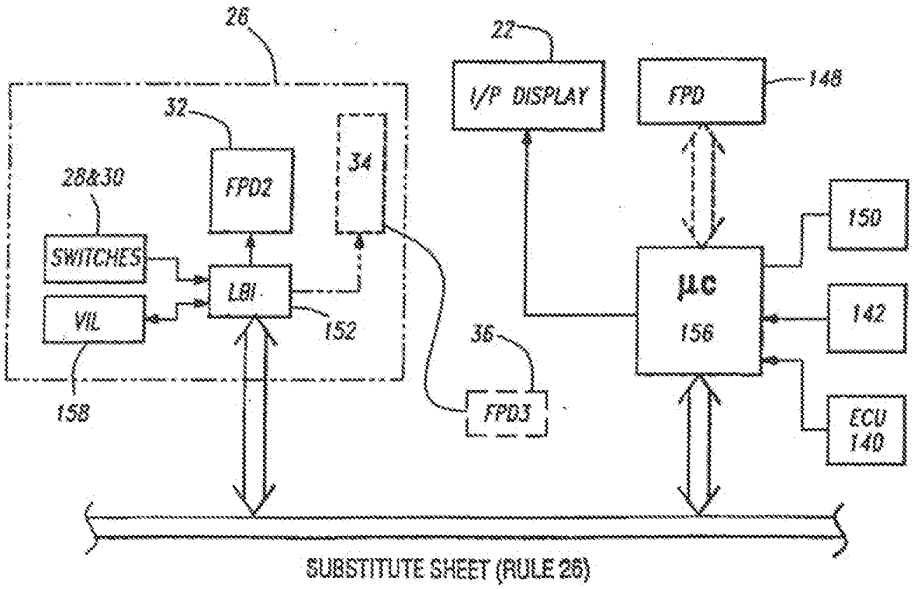


Fig-13a

Fig-13b



INTERNATIONAL SEARCH REPORT

Int. ional Application No
PCT/US 96/16205

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B60R16/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 B60R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 40 33 832 A (MITSUBISHI) 27 June 1991 see the whole document ---	1-20
X	DE 40 33 574 A (HITACHI) 8 May 1991 see column 3, line 12 - column 5, line 6 see column 9, line 20 - column 15, line 10; figures 2,3,6,9,11 ---	1-7, 10-15, 17-20
Y	DE 43 28 564 C (MERCEDES - BENZ) 25 August 1994 see column 2, line 54 - column 4, line 11; figure 1 ---	1-20
Y	DE 43 38 171 C (MERCEDES - BENZ) 20 April 1995 see the whole document ---	1-20

-/--

[X] Further documents are listed in the continuation of box C. [X] Patent family members are listed in annex.

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

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Date of the actual completion of the international search	Date of mailing of the international search report
31 January 1997	05. 02. 97

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl, Fax (+ 31-70) 340-3016	Geyer, J-L

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INTERNATIONAL SEARCH REPORT

Int. Appl. No. PCT/US 96/16205

C(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0 366 132 A (B.M.W) 2 May 1990 see the whole document	1-20
Y	MEASUREMENT + CONTROL, vol. 25, no. 9, November 1992, GB, LONDON, pages 264-268, XP000320446 KNOLL ET AL.: "ADVANCED INTEGRATED DRIVER INFORMATION SYSTEMS" see the whole document	1-20

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INTERNATIONAL SEARCH REPORT

Information on patent family members

Int. ...onal Application No
PCT/US 96/16205

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
DE-A-4033832	27-06-91	JP-A-	3137686	12-06-91
		US-A-	5539429	23-07-96
DE-A-4033574	08-05-91	JP-A-	3135853	10-06-91
		US-A-	5467277	14-11-95
DE-C-4328564	25-08-94	NONE		
DE-C-4338171	20-04-95	FR-A-	2712409	19-05-95
		GB-A-	2283714	17-05-95
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		DE-A-	4001662	18-07-91
		DE-D-	58908735	19-01-95
		ES-T-	2064418	01-02-95
		JP-A-	2187814	24-07-90
		US-A-	5270689	14-12-93

Form PCT/ISA/210 (patent family annex) (July 1992)

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Certification of Translation

COMMONWEALTH OF MASSACHUSETTS
COUNTY OF MIDDLESEX

On this day of March 18, 2009

Dana Morris

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His qualifications as translator include familiarity with English as a native language and with Japanese as an acquired language, and with said languages as languages of instruction and use for more than 12 years, and that he received a Ph.D. degree from the University of California and that he is employed as a freelance translator by Linguistic Systems, Inc.

Michael Hundt
Translation Manager

Translator' s Signature

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Hugh McAden Oechler
Notary Public
My commission expires March 19, 2015

HUGH McADEN OECHLER
NOTARY PUBLIC
COMMONWEALTH OF MASSACHUSETTS
My Commission Expires Mar. 19, 2015

(12) UNEXAMINED PATENT GAZETTE (A)

(19) Japan Patent Office (JP)

(11) Unexamined Patent Application
No. H11-317061
(43) Published November 16, 1999

(51) Int. Cl.[6]	ID Symbol	FI	
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G06F 3/00	651	G06F 3/00	651A

Request for Examination: not yet submitted
Number of Claims: 2 OL (8 pages total)

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(22) Application Date: April 30, 1998

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continued on last page

(54) TITLE OF THE INVENTION A Character Information Control System for a Digital Recording Medium Using a Television Screen

(57) ABSTRACT

OBJECT To provide a character information control system capable of easily retrieving and entering characters in many digital recording media in AV equipment while viewing a display screen displayed on a television screen.

CONSTITUTION A system comprises a CD reproducing device 1 and an MD reproducing device 2, a receiver 10 connected to the reproducing devices 1 and 2 by bidirectional equipment control communication lines L3 and L4 and provided with a CPU 7 for commanding and controlling CPUs 8 and 9 of the reproducing devices 1 and 2 so as to read character information S1 and S2 recorded in memory devices 3 and 4 of the reproducing devices 1 and 2 for writing in a memory device 6 by asynchronous bidirectional communication lines L1 and L2 and to organize the character information S1 and S2 for output to a video output terminal Vout, and a television 15, the video input terminal Vin of which is connected to the video output terminal Vout of the receiver 10 by a line L5. CD or MD character information S1 or S2 is displayed on a television screen 15W according to a predetermined retrieval format to retrieve and select character information from a CD or MD stored in the reproducing device 1 or 2 while viewing the television screen 15W.

CLAIMS

1. A character information control system for a digital recording medium using a television screen, characterized by comprising a reproducing device for a digital recording medium , a receiver connected to said reproducing device and provided with a CPU (central processing unit) for controlling so as to read the character information of a digital recording medium read by said reproducing device and recorded in a memory device of said reproducing device by an asynchronous bidirectional communication line for writing in its own memory device and to organize said character information for output to a video output terminal, and a television receiver, the video input terminal of which is connected to the video output terminal of said receiver, said receiver using a character array of at least 10 rows × 20 columns on the television screen of said television receiver to display the character information of said digital recording medium stored by said reproducing device so as to retrieve and select the character information of said digital recording medium while viewing the character display on said television screen, and displaying characters for making said television screen a screen keyboard on said television screen for sending a command to write the character information in said reproducing device to its own CPU (central processing unit) through an asynchronous bidirectional communication line so as to enter the information of characters displayed on said television screen selected using the cursor of its own remote controller to the memory device of said reproducing device, and the CPU (central processing unit) of said reproducing device controlling so as to write said character information in the memory device of said reproducing device or directly in a rewritable digital recording medium.

DETAILED EXPLANATION OF THE INVENTION

[0001]

INDUSTRIAL FIELD OF APPLICATION

The present invention relates to a character information control system for a digital recording medium in AV (audiovisual) equipment, and more particularly, to a character information control

system for a digital recording medium used mainly for having the receiver of a single master device retrieve and select character information written on the memory devices of reproducing devices (slave devices) such as a CD player or an MD deck by asynchronous bidirectional communication lines while displayed on a television screen.

[0002]

PRIOR ART

Digital AV equipment such as CD (compact disc) players, MD (minidisc) decks, or DVD (digital video disc) players for reproducing today's digital recording media typically have a small display panel such as a liquid crystal or FL (fluorescent lamp) display element on the front of the equipment for displaying track numbers or track sequence, play times, and total play time (TOC information).

[0003]

Specifically, a TOC (Table of Contents) information area is disposed on the innermost section of an MD or a CD, where are recorded all of the addresses of the start positions and the addresses of the end positions of every track. Therefore, this TOC information is read first when starting reproduction to enable instantaneous retrieval of each track thereafter.

[0004]

The user can use a device at hand such as a remote controller to easily select and enjoy a desired music track or video while viewing the TOC information displayed on the display panel screen of a reproducing device for digital recording media such as CDs, MDs, and DVDs.

[0005]

This display panel of a reproducing device can usually only display at most several tens of characters in one or two rows due to considerations such as cost limitations, minimizing power consumption, and limits imposed by the size of the panel area.

[0006]

Players mounted in series or a player combined with separate so-called changers (called a CD changer and an MD changer) for storing many digital recording media such as CDs, from which one may be freely selected for reproduction, have spread focusing on car audio equipment. The number of these digital recording media stored, however, is at most about ten.

[0007]

Besides conventional TOC (Table of Contents) information, however, the information on digital recording media has begun in the case of CDs to employ a new standard called "CD text" in the TOC information area, where much individual information is recorded, such as titles, performers, genres, songwriters, composers, arrangers, and messages.

[0008]

PROBLEMS THAT THE INVENTION IS TO SOLVE

With the rapid spread of digital recording media such as CDs, MDs, and DVDs, it may be anticipated that households will face the unavoidable task of managing all of an increasing number of several tens to several hundreds of these digital recording media. Specifically, this will require changers capable of storing several hundred CDs, and an improved CD search function will be indispensable. That is, instead of just putting several digital recording media in a case and storing on a shelf as a library like today, a system will be demanded that can quickly select a desired digital recording medium from among many digital recording media at any time that one wishes to hear or view the medium, and can also select a desired music track or video from this medium to enjoy on a television or a stereo.

[0009]

A conventional display panel of a reproducing device, however, takes time for search operations because the simultaneous displayable character capacity is no several tens of characters as noted earlier. When the individual information of a CD text is used as search data in the future, checking search statuses (search results) one by one with little character information displayed will require a lot of time.

[0010]

When writing character information in the TOC area (U-TOC) of a digital recording medium such as an MD or writing the individual character information of a stored CD in the memory device of a CD player, entering characters by means such as a jog dial or push buttons has the problems of being a nuisance and prone to errors.

[0011]

On this point, steady progress is being made total systemization of AV equipment in a household, such as a television, a video player, and a stereo, but the main current of such a system, today and in the future, will likely be total systemization of AV equipment focusing on a television screen, which is the most widespread of visual devices (display devices) in a household, and connecting to digital AV equipment (reproducing devices) for media such as CDs, MDs, and DVDs as digital image and digital sound sources. Using a television screen as a display panel for all reproducing devices of digital recording media will allow display of a large volume of character information..

[0012]

Individually connecting CD, MD, and DVD equipment along with other equipment such as a video cassette recorder (VCR) simultaneously to the limited video input terminals (usually one or two) of a television, however, will be difficult.

[0013]

Reflecting on this situation, the present invention provides a character information control system for digital recording medium using television screen that besides a master device receiver provided with many input and output terminals capable of connecting and controlling reproducing devices for digital recording media as slave devices by equipment control communication lines, can supply all video outputs through a single video input/output line to a television, which is found in nearly 100% of households, and execute search and control using a television screen capable of simultaneously

displaying a large volume of character information from many digital recording media such as CDs, MDs, and DVDs stored in several reproducing devices.

[0014]

MEANS OF SOLVING THE PROBLEMS

The present invention solves these problems by providing

(1) A character information control system for a digital recording medium using a television screen, characterized by comprising a reproducing device for a digital recording medium , a receiver connected to the reproducing device and provided with a CPU (central processing unit) for controlling so as to read the character information of a digital recording medium read by the reproducing device and recorded in a memory device of the reproducing device by an asynchronous bidirectional communication line for writing in its own memory device and to organize the character information for output to a video output terminal, and a television receiver the video input terminal of which is connected to the video output terminal of the receiver, the receiver using a character array of at least 10 rows × 20 columns on the television screen of the television receiver to display the character information of the digital recording medium stored by the reproducing device so as to retrieve and select the character information of the digital recording medium while viewing the character display on the television screen, and displaying characters for making the television screen a screen keyboard on the television screen for sending a command to write the character information in the reproducing device to its own CPU (central processing unit) through an asynchronous bidirectional communication line so as to enter the information of characters displayed on the television screen selected using the cursor of its own remote controller to the memory device of the reproducing device, and the CPU (central processing unit) of the reproducing device controlling so as to write the character information in the memory device of the reproducing device or directly in a rewritable digital recording medium;

[0015]

and also solves these problems by providing

(2) A character information control system for a digital recording medium using a television screen, characterized by comprising a multi-reproducing device for reproducing a plurality of compact discs, a receiver connected to the multi-reproducing device and provided with a CPU (central processing unit) for controlling so as to read the character information of a compact disc read by the multi-reproducing device and recorded in a memory device of the multi-reproducing device by an asynchronous bidirectional communication line for writing in its own memory device and to organize the character information for output to a video output terminal, and a television receiver, the video input terminal of which is connected to the video output terminal of the receiver, and the receiver reading the CD text information of a compact disc written in the memory device in the multi-reproducing device to write in its own memory device, and having retrieval means designed so as to display a retrieval screen for selecting from among the three items of the performer, the disc title, and the genre contained in the CD text information to retrieve and select character information on a plurality of compact discs on the television screen of the television receiver using a character array of at least 10 rows × 20 columns.

[0016]

In short, the present invention is a system capable of easily retrieving and entering characters in the character information of digital recording media in many reproducing devices such as a CD player, an MD deck, and a CD/MD changer connected to a single receiver (master device) while viewing a search screen or a screen keyboard displayed on a television screen.

[0017]

Besides a so-called television provided with a standard receiving circuit for receiving a TV broadcast for display on a screen, "television" here also includes a monitor screen without a receiving circuit.

[0018]

BEST MODE FOR CARRYING OUT THE INVENTION

Embodiments of the present invention will be discussed based on the appended drawings.

[0019]

Fig. 1 is a block diagram showing the configuration of a character information control system for adigital recording medium using a television screen according to the present invention.

[0020]

Fig. 2 is an example of a display screen simultaneously displaying the character information (disc information and track information) of one CD selected by a CD player displayed on a television screen according to the present invention.

[0021]

Figs. 3 and 4 are examples of display screens when entering characters using a television screen according to the present invention as a screen keyboard.

[0022]

Fig. 5 is an example of an initial search screen for setting a search method for searching for a desired disc within a multi-CD changer according to the present invention.

[0023]

Fig. 6 is an example of a search screen when searching from among performers within a multi-CD changer according to the present invention.

[0024]

Fig. 7 is an example of a search screen for searching from among disc titles within a multi-CD changer according to the present invention.

[0025]

Fig. 8 is an example of a search screen when searching from among genres pertaining to a desired disc within a multi-CD changer according to the present invention.

[0026]

Fig. 9 is an example of a display screen displaying search results when searching from among performers.

[0027]

First, the character information control system for digital recording medium using television screen 30 of the present invention shown in Fig. 1 comprises a CD reproducing device 1 and an MD reproducing device 2, a receiver 10 connected to the reproducing devices 1 and 2 by bidirectional equipment control communication lines L3 and L4 and provided with a CPU 7 for commanding and controlling CPUs 8 and 9 of the reproducing devices 1 and 2 so as to read character information S1 and S2 recorded in memory devices 3 and 4 of the reproducing devices 1 and 2 for writing in a memory device 6 by asynchronous bidirectional communication lines L1 and L2 and to organize the character information S1 and S2 for output to a video output terminal Vout, and a television 15, the video input terminal Vin of which is connected to the video output terminal Vout of the receiver 10 by a line L5. This forms a system configuration in which the character information S1 or S2 of a digital recording medium is displayed on the television screen 15W of the television 15 according to a predetermined retrieval format using a character array of at least 10 rows × 20 columns (200 characters), and the receiver is controlled to retrieve and select the character information S1 or S2 from a digital recording medium CD or MD stored in the reproducing device 1 or 2 while viewing the character display on the television screen 15W.

[0028]

Besides this configuration, the receiver 10 sends a command to write character information in the reproducing devices 1 and 2 to the CPU (central processing unit) 7 through asynchronous bidirectional communication line L1 and L2 so as to select and enter characters in memory devices 3 and 4 of the reproducing devices 1 and 2 while viewing the television screen 15W using the cursor keys of a remote

controller (not shown) of the receiver 10 with the television screen 15W as a screen keyboard, and the CPUs (central processing units) 8 and 9 of the reproducing devices 1 and 2 exercise control so as to write the character information S2 in their memory devices 3 and 4 or directly in a rewritable digital recording medium (typically an MD).

[0029]

A RAM housed in the CPU 7 may be used for the memory device 6 in the receiver 10 in practice.

[0030]

In short, the present system 30 is configured such that the receiver 10 functioning as a single master device controls the reproducing device (CD player) 1 and the reproducing device (MD deck) 2 functioning as a plurality of slave devices to allow easily searching digital recording media and entering characters while viewing character information displayed by the television screen 15W.

[0031]

Both sets of the asynchronous bidirectional communication lines L1 and L2 and the bidirectional equipment control communication lines L3 and L4 are cables comprising a ground line and two character information communication lines or equipment control communication lines (L1 and L3, and L2 and L4 can also be coiled together as one cable). The communication carried out by the bidirectional equipment control communication lines L3 and L4 is used to send commands, such as playback or stop, to the reproducing devices, and to acquire equipment status information from the reproducing devices. Commands involving reading or writing character information are handled by the asynchronous bidirectional communication lines L1 and L2, which send and receive these data in the same way as during conventional asynchronous bidirectional communication.

[0032]

Since standard cables can be used for the communication lines between equipment in the present

invention, these lines offer a greater cost advantage than using the display screen of a personal computer, and greater convenience by not requiring the cumbersome operation of connecting a personal computer and starting up a software. That means, using a television screen, which is found in nearly every household, has much greater universal applicability than using a personal computer screen.

[0033]

Next, an example of display of character information on a television screen will be discussed based on Fig. 2.

[0034]

In Fig. 2, the disc information and track information of a selected CD from the CD player of the reproducing device 1 are displayed on the television screen 15W by a character display of 12 rows × 24 columns (maximum of 288 characters).

[0035]

Line 1: Indicates that the audio source (SOURCE) is a CD.

[0036]

Line 2: The icon ∧ (selecting this row inverts ∧). Pressing SET skips back one disc.

[0037]

Line 3: Displays the disc number and the performer (PERFORMER). For example, the drawing displays that the CD number is 196 and the first 13 characters of the singer's name are Michael Jacks.

[0038]

Selecting this row inverts the entire row and displays «»: MODE in line 10. (CD-TEXT disc only)

Line 11 displays SET: PLAY, and reproduces this disc if pressed. (Normally, line 11 displays SET: OPERATE.)

If the characters are longer than 13 characters, scrolling left one character at a time to the end

will display the first 13 characters.

[0039]

Pressing the MODE key toggles line 3 between DISK TITLE → PERFORMER → GENRE → SONGWRITER → COMPOSER → ARRANGER → MESSAGE, and displays the information in line 4. If the disc has no information, "NO DATA" is displayed.

[0040]

Line 4: Displays the icon ∨ and, in initial state, the disc title.

[0041]

Selecting this row inverts ∨. Pressing SET skips to the last disc.

[0042]

Line 5: The icon ∧ (selecting this row inverts ∧).

This icon is not displayed when starting from TRACK 1.

[0043]

Pressing SET skips back one track.

[0044]

Line 6: Displays the current track number and the track title in yellow.

[0045]

Selecting this line inverts the entire row and displays «»: MODE in line 10. (CD-TEXT disc only)

Line 11 displays SET: PLAY, and reproduces this track if pressed.

[0046]

If the characters are longer than 13 characters, scrolling left one character at a time to the end will display the first 13 characters.

[0047]

Pressing the MODE key toggles just this row between SONG TITLE → PERFORMER.

[0048]

If the disc has no information, "NO DATA" is displayed.

[0049]

Lines 7 and 8: Displays the track number and the track title of the next track after the current track.

[0050]

If there are three tracks remaining, the arrow symbol in line 9 is extinguished.

[0051]

If there are one or two tracks remaining, the next line displays just "TRACK :".

[0052]

Line 9: The icon ∨ (selecting this row inverts ∨).

During track feeding, scrolls one track.

[0053]

Line 10: Selecting this section inverts SEARCH, and pressing the SET key goes to the SEARCH screen.

[0054]

Line 11: Selecting this section inverts USERFILE, and pressing the SET key goes to the USERFILE screen.

[0055]

Line 12: Selecting this section inverts TITLE INPUT, and pressing the SET key goes to the TITLE INPUT screen.

[0056]

Pressing EXIT goes to the MAIN MENU of the receiver.

[0057]

Thus, by displaying disc information and track information on the same screen using a television screen with a character display of 12 rows × 24 columns in the present system, the user can easily and quickly retrieve a desired track without error and without repeating a cumbersome operation. The character display of 12 rows × 24 columns is one example. In trials by the inventors, ease of searching was realized provided that the character array was at least 10 rows × 20 columns. Needless to say, increasing the performance of the CPU 7 may realize a character array larger than the example.

[0058]

Next, as the means for entering characters, the most common method previously has been to send and select Roman alphabet upper-case letters (27 characters), lower-case letters (27 characters), numerals (10 characters), and symbols (about 20 characters). The present invention, however, uses a television screen to comprise a screen keyboard such as shown in Figs. 3 and 4, allowing characters to be selected while viewing the television screen simply by operating the cursor keys (buttons indicating left, right, up, and down) of the remote controller of the receiver 10. It should be clear that characters can be entered simply and securely in this way.

[0059]

Next, in a particular mode of the present system 30, the reproducing device 1 is a reproducing device for a plurality of compact discs as digital recording media (a so-called CD changer), and the receiver 10 has search means for reading the CD text information of all of the compact discs written in the memory device 3 of the reproducing device 1 to write in its own memory device 6, and selecting and retrieving one of the three items of the performer, the disc title, and the genre contained in this CD text information.

[0060]

For example, as is clear from the search method selection screen shown in Fig. 5, one of the performer, the disc title, or the genre is selected as a method for retrieving a desired one CD from a CD changer (storing two-hundred CDs).

[0061]

If the method of searching by performer is selected as indicated by ⇒⇒ in Fig. 5, the first character of the performer's name is entered by a cursor from the screen keyboard as shown in Fig. 6.

[0062]

If the method of searching by disc title is selected, the first character of the disc title is entered in the same way as shown in Fig. 7.

[0063]

If the method of searching by genre is selected, one from among five genres displayed is selected (scrolling up or down if none) as shown in Fig. 8.

[0064]

The genres are one of "ADULT CONTEMPORARY, ALTERNATIVE ROCK, CHILDRENS MUSIC, CLASSICAL, COUNTRY, DANCE, EASY LISTENING, EROTIC, FOLK, GOSPEL, HIP HOP, JAZZ, LATIN, MUSICAL, NEW AGE, OPERA OPERATTA, POP MUSIC, RAP, REGGAE, ROCK MUSIC, RHYTHM EFFECTS, SOUND EFFECTS, SOUNDTRACK, SPOKEN WORD, and WORLD MUSIC" given in the CD text information.

[0065]

Fig. 9 is an example of a screen display of search results when searching when the method of searching by performer was selected and "A" was entered as the first character. When searching by performer in this way, first, a list of performers is displayed, for which disc titles can be displayed by switching the mode. Displaying the information of several discs on one screen at this time greatly improves search efficiency compared to displaying the information of just one disc on one screen.

Moving the cursor to select a desired disc and pressing the SET key can start reproducing that disc.

[0066]

If searching by disc title or genre, first, a list of disc titles is displayed, for which performers can be displayed by switching the mode.

[0067]

Thus, whereas it is usually not easy to search for a desired disc in a CD changer having a storage capacity of several hundred CDs, conventional reproducing devices had no function for searching from a long list of disc titles, but took time to search among over one-hundred discs. The present invention can execute a search in a short time using a method that broadens the range of search options and makes it easy for a user to retrieve a desired disc by employing a system allowing a user to select a preferred search method from among three types of search methods and search while viewing a television screen.

[0068]

As an added note by way of precaution, carrying out the operation of searching and entering characters for all of several reproducing devices contained in a system for different types of digital recording media while using a television screen as a display device is not yet a concept in conventional AV equipment.

[0069]

EFFECTS OF THE INVENTION

As discussed above, the character information control system for digital recording medium using television screen according to the present invention has

(1) The excellent effect of allowing display of character information of many digital recording media, such as simultaneous display of the disc information and the track information of searched digital recording media such as CDs or MDs, and allowing easy and rapid checking and selection of character information by being able to simultaneously display two-hundred or more characters of character

information in digital recording media in audio fields such as CDs or MDs on a television screen;

[0070]

(2) The excellent effect that character information can be easily entered in the memory device of a reproducing device or a rewritable digital recording medium while viewing a screen keyboard displayed on a television screen;

[0071]

(3) The excellent effect that the present invention can use a television with an existing video input terminal as a display device for character information without modification, and can realize total systemization of all control of the character information of digital recording media of several pieces of AV equipment while viewing a television screen; and

[0072]

(4) The excellent effect of allowing a user to retrieve a desired disc in a short time by the easiest search method for the user while viewing a television screen by being able to select search means for several CDs from the three search targets of the performer, the disc title (album title), and the genre.

BRIEF EXPLANATION OF THE DRAWINGS

FIG 1. is a block diagram showing the configuration of a character information control system for a digital recording medium using a television screen according to the present invention.

FIG. 2 is an example of a display screen simultaneously displaying the character information (disc information and track information) of one CD selected by a CD player displayed on a television screen according to the present invention.

FIG. 3 is an example of a display screen when entering characters using a television screen according to the present invention as a screen keyboard.

FIG. 4 is an example of a display screen when entering characters using a television screen according to the present invention as a screen keyboard.

FIG. 5 is an example of an initial search screen for setting a search method for searching for a desired disc within a multi-CD changer according to the present invention.

FIG. 6 is an example of a search screen when searching from among performers within a multi-CD changer according to the present invention.

FIG. 7 is an example of a search screen for searching from among disc titles within a multi-CD changer according to the present invention.

FIG. 8 is an example of a search screen when searching from among genres pertaining to a desired disc within a multi-CD changer according to the present invention.

FIG. 9 is an example of a display screen displaying search results when searching from among performers.

EXPLANATION OF REFERENCE NUMBERS

1	Reproducing device (CD player or CD changer)
2	Reproducing device (MD deck)
3, 4, 6	Memory devices
7, 8, 9	CPU
10	Receiver
15	Television receiver
15W	Television screen
30	Character information control system
L1, L2	Asynchronous bidirectional communication line
L3, L4	Bidirectional equipment control communication line
L5	Line
S1, S2	Character information
Vout	Video output terminal

Vin Video input terminal

FIG. 1

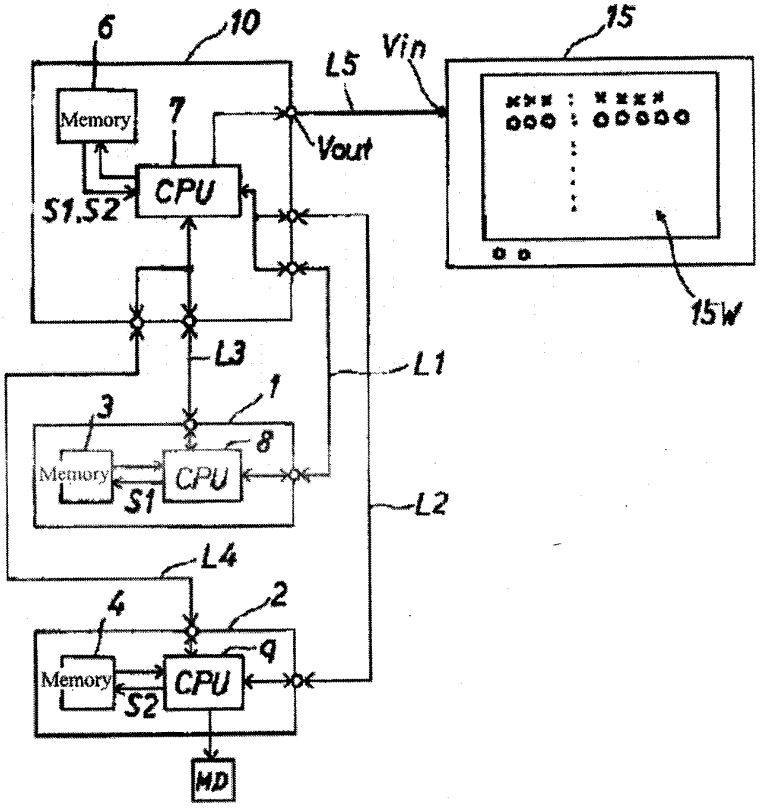


FIG. 2

Line 1	SOURCE : CD JVC
Line 2	∧
Line 3	→DISC 06 : Michael Jacks
Line 4	∨ BLOOD ON THE
Line 5	∧
Line 6	TRACK 3 : Ghosts
Line 7	TRACK 4 : Is It Scary
Line 8	TRACK 5 : Scream Louder
Line 9	∨
Line 10	SEARCH ≪≫ : MODE
Line 11	USER FILE SET : PLAY
Line 12	TITLE INPUT EXIT : EXIT

20

FIG. 3

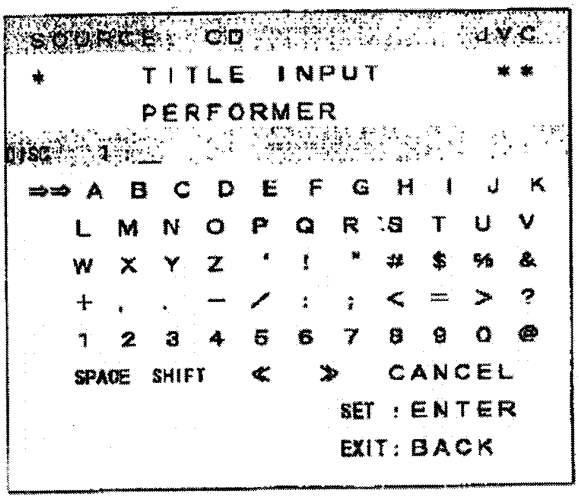


FIG. 4

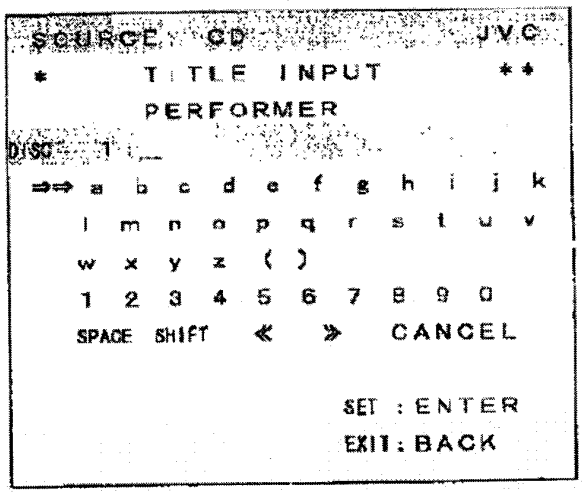


FIG. 5

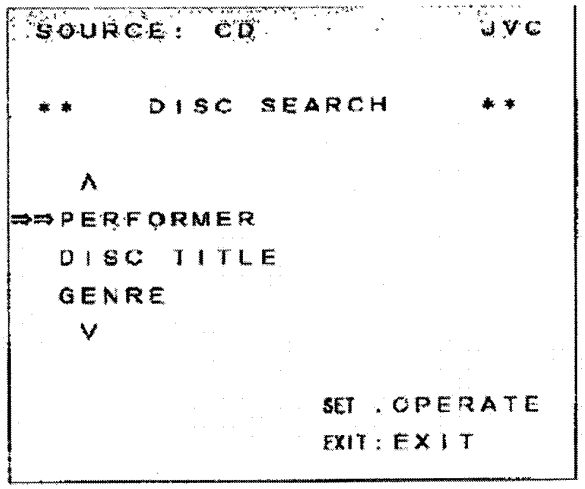


FIG. 6

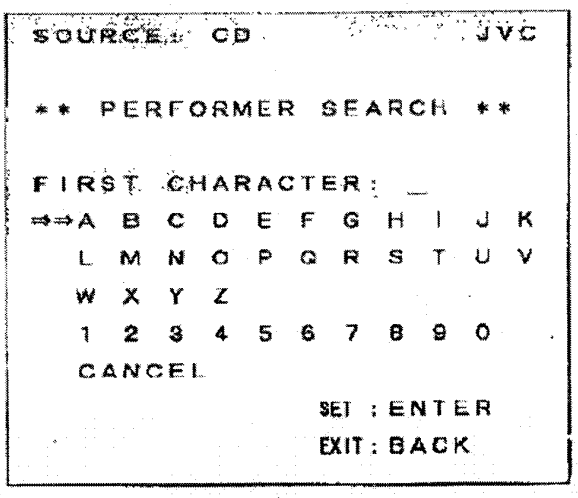


FIG. 7

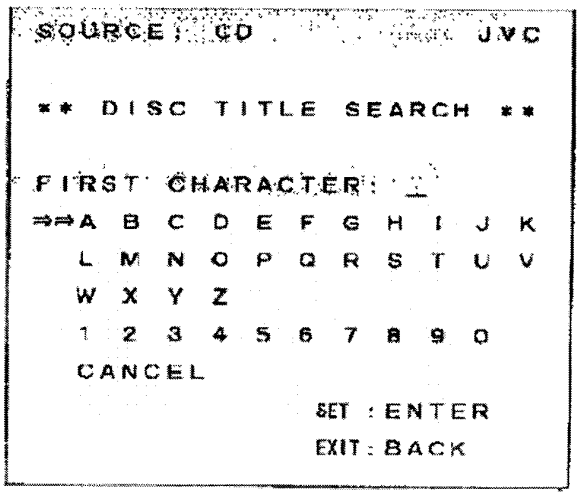


FIG. 8

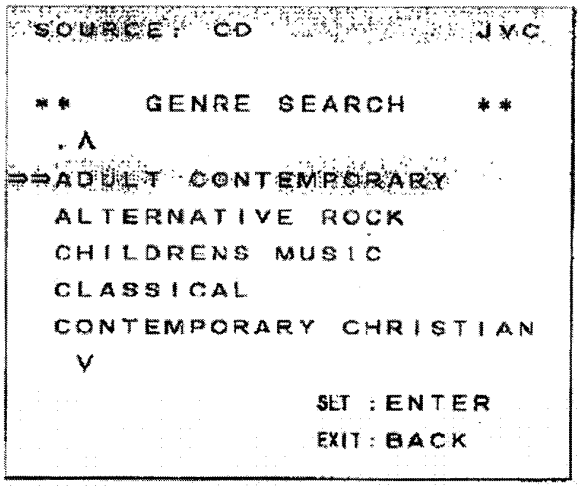
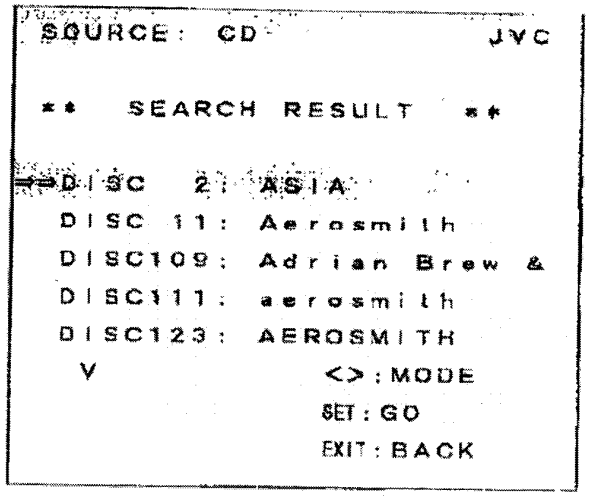


FIG. 9



Continued from front page

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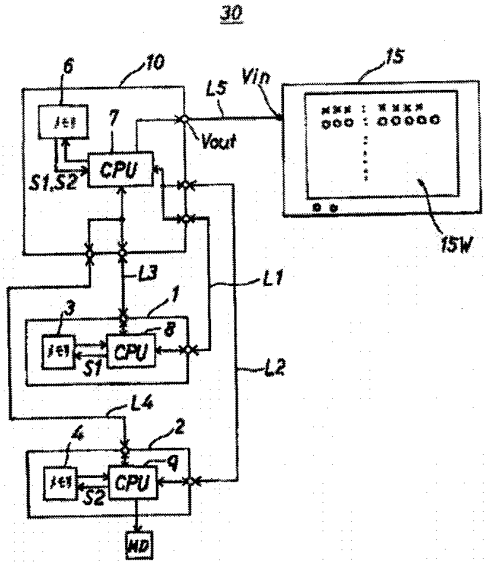
(54)【発明の名称】　テレビジョン画面を利用したデジタル記録媒体の文字情報制御システム

(57)【要約】

【目的】　ＡＶ機器における多数のデジタル記録媒体の検索と文字入力がテレビジョン画面に映し出された表示画面を見ながら容易にできるようにした文字情報制御システムを提供する。

【構成】ＣＤの再生装置１とＭＤの再生装置２と、前記再生装置１、２の各メモリ装置３、４に記録された文字情報Ｓ１、Ｓ２を非同期式双方向通信ラインＬ１、Ｌ２によって読み出してメモリ装置６に書き込むとともに前記文字情報Ｓ１、Ｓ２を整理してビデオ出力端子Ｖoutに出力するように再生装置１、２のＣＰＵ８、９に文字情報読み取りの命令を行い制御するＣＰＵ７を備え、再生装置１、２と双方向の機器制御通信線Ｌ３，Ｌ４で接続されたレシーバー１０と、ビデオ入力端子Ｖinが前記レシーバー１０のビデオ出力端子Voutとライン Ｌ５で結線されたテレビジョン１５と、でシステム構成され、テレビジョン画面１５Ｗに前記ＣＤまたはＭＤの文字情報Ｓ１またはＳ２を所定の検索様式に従って表示するとともに、再生装置１、２に収納されたＣＤやＭＤの検索と選択をテレビジョン画面１５Ｗを見ながら行う構成。



【特許請求の範囲】
【請求項１】デジタル記録媒体の再生装置と、前記再生装置によって読み出されて前記再生装置のメモリ装置に記録されたデジタル記録媒体の文字情報を非同期式双方向通信ラインによって読み出して自身のメモリ装置に書き込むとともに前記文字情報を整理してビデオ出力端子に出力するように制御するＣＰＵ（中央情報処理装置）を備え、前記再生装置と接続されたレシーバーと、備え付けのビデオ入力端子が前記レシーバーのビデオ出力端子と結線されたテレビジョン受像機と、から構成され、前記レシーバーは前記テレビジョン受像機のテレビジョン画面に少なくとも１０行×２０列以上の文字配列を以て前記再生装置に収納された前記デジタル記録媒体の文字情報を表示させて前記デジタル記録媒体の文字情報検索と選択を前記テレビジョン画面の文字表示を見ながら行うようにするとともに、前記テレビジョン画面を画面キーボードとするための文字を前記テレビジョン画面上に表示して、自身のリモコン装置のカーソルキーによって選択された前記テレビジョン画面上の表示文字の情報を前記再生装置のメモリ装置に文字入力するように自身の前記ＣＰＵ（中央情報処理装置）にて前記再生装置内に文字情報書き込みの命令を非同期式双方向通信ラインを通して送り、前記再生装置内のＣＰＵ（中央情報処理装置）は前記再生装置のメモリ装置または書き込み可能なデジタル記録媒体自身に前記文字情報を書き込むように制御することを特徴とするテレビジョン画面を利用したデジタル記録媒体の文字情報制御システム。
【請求項２】コンパクト・ディスクの複数枚再生装置と、前記複数枚再生装置によって読み出されて前記複数枚再生装置のメモリ装置に記録されたコンパクト・ディスクの文字情報を非同期式双方向通信ラインによって読み出して自身のメモリ装置に書き込むとともに前記文字情報を整理してビデオ出力端子に出力するように制御するＣＰＵ（中央情報処理装置）を備え、前記複数枚再生装置と接続されたレシーバーと、備え付けのビデオ入力端子が前記レシーバーのビデオ出力端子と結線されたテレビジョン受像機と、から構成され、前記レシーバーは前記複数枚再生装置内のメモリ装置に書き込まれたコンパクト・ディスクのＣＤテキスト情報を読み出して自身のメモリ装置に書き込むとともに、前記ＣＤテキスト情報に含まれるパーフォーマー（演奏者）名とディスクタイトル名とジャンル名の３つの項目から１つを選択して複数枚のコンパクト・ディスクの文字情報を検索・選択する検索画面を前記テレビジョン受像機のテレビジョン画面に少なくとも１０行×２０列以上の文字配列を以て表示させるようにした検索手段を有することを特徴とするテレビジョン画面を利用したデジタル記録媒体の文字情報制御システム。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、ＡＶ（オーディオ・ビデオ）機器におけるデジタル記録媒体の文字情報制御システムに関し、詳細には１台のマスター機器のレシーバーがＣＤプレーヤ、ＭＤデッキ等の再生装置（スレーブ機器）のメモリ装置に書き込まれた文字情報を非同期式双方向通信ラインによってテレビジョン画面に表示しつつ検索・選択することを主とするデジタル記録媒体の文字情報制御システムに関する。
【０００２】
【従来の技術】現在のデジタル記録媒体を再生するＣＤ（コンパク・トディスク）プレーヤ、ＭＤ（ミニ・ディスク）デッキ、ＤＶＤ（デジタル・ビデオ・ディスク）プレーヤー等のデジタルＡＶ機器は、機器前面に液晶やＦＬ（蛍光表示素子）等の小さな表示パネルを有するものが一般的であり、ここに当該再生するデジタル記録媒体に収納されている曲数や曲番、各演奏時間、トータル演奏時間（ＴＯＣ情報）を表示するようになっている。
【０００３】即ち、ＭＤやＣＤにはその最内周部にＴＯＣ（Table of Contents）情報エリアが設けられており、各曲のスタート位置のアドレスとエンド位置のアドレスが全てここに記録されているので、先ず再生の始めにこのＴＯＣ情報を読み出すようにして、以後の各曲の検索を瞬時に行うことができるようになっている。
【０００４】而して、ユーザーはＣＤやＭＤさらにＤＶＤ等のデジタル記録媒体の再生装置の表示パネル面に表示されたＴＯＣ情報を見ながら手元のリモコン装置等を使って簡単に目的の曲や映像を選択して楽しむことができるのである。
【０００５】尚、上記再生装置の表示パネルはコスト制限、消費電力抑制、パネル面積の寸法上の制限等から多くとも１～２行で十数文字しか同時には表示できないのが通常である。
【０００６】ところで、上記ＣＤ等のデジタル記録媒体を多数枚収納して、その中から自由に任意の一枚を選択して再生する連装プレーヤーや、プレーヤーと一体または別体の所謂チェンジャー（ＣＤチェンジャー、ＭＤチェンジャーと称される。）がカーオーディオ機器を中心に普及しているが、これらのデジタル記録媒体の収納枚数は多くとも１０枚程度である。
【０００７】また一方で、デジタル記録媒体の情報は従来のＴＯＣ（Table of Contents）情報に加えて、例えばＣＤではＴＯＣ情報エリア内に所謂「ＣＤテキスト」と称される新しい規格が採用され始めており、ここにはタイトル、パーフォーマー、ジャンル、ソングライター、コンポーザー、アレンジャー、メッセージ等の多くの個別情報が記録されるようになっている。
【０００８】
【発明が解決しようとする課題】ＣＤ、ＭＤ、ＤＶＤ等のデジタル記録媒体の急速な普及は、一般家庭においても数十、数百枚に増えた上記デジタル記録媒体のトータ

文字情報制御システム、を提供することにより上記課題を解決する。

【００１６】尚、本発明は、１台のレシーバー（マスター機器）に接続された複数台のＣＤプレーヤーやＭＤデッキ及びＣＤ／ＭＤチェンジャー等の再生装置のデジタル記録媒体の文字情報の検索や文字入力がテレビジョン画面に映し出された検索画面や画面キーボードを見ながら容易にできるようにしたシステムである。

【００１７】尚、上記テレビジョンとはＴＶ放送を受信して画面に映し出す通常の受信回路を備えた所謂テレビの他、受信回路を含まないモニター画面をも含むものである。

【００１８】

【発明の実施の形態】本発明の実施の形態を図面に基づき説明する。

【００１９】図１は本発明に係るテレビジョン画面を利用したデジタル記録媒体の文字情報制御システムの構成を示すブロック図である。

【００２０】図２は本発明に係るテレビジョン画面に表示されたＣＤプレーヤーから選択された１枚のＣＤの文字情報（ディスク情報、トラック情報）を同時に表す表示画面の例である。

【００２１】図３及び図４は本発明に係るテレビジョン画面を画面キーボードとして文字入力する際の表示画面の例である。

【００２２】図５は本発明に係る多数枚ＣＤチェンジャーの中から希望ディスクを検索する検索方法を設定する初期検索画面の例である。

【００２３】図６は本発明に係る多数枚ＣＤチェンジャーの中から演奏者名から検索する場合の検索画面の例である。

【００２４】図７は本発明に係る多数枚ＣＤチェンジャーの中から希望ディスクのディスクタイトル名から検索する場合の検索画面の例である。

【００２５】図８は本発明に係る多数枚ＣＤチェンジャーの中から希望ディスクが属するジャンル名から検索する場合の検索画面の例である。

【００２６】図９は演奏者名から検索した場合の検索結果を表す表示画面の例である。

【００２７】先ず、図１に示される本発明のテレビジョン画面を利用したデジタル記録媒体の文字情報制御システム３０は、デジタル記録媒体の典型であるＣＤの再生装置１とＭＤの再生装置２と、前記再生装置１、２によって読み出されてその各メモリ装置３、４に記録されたデジタル記録媒体の文字情報Ｓ１、Ｓ２を非同期式双方向通信ラインＬ１、Ｌ２によって読み出してメモリ装置６（ＲＡＭ）に書き込むとともに前記文字情報Ｓ１、Ｓ２を整理してビデオ出力端子Ｖoutに出力するように再生装置１、２のＣＰＵ８、９に文字情報読み取りの命令を行い制御するＣＰＵ（中央情報処理装置）７を備え、前記再生装置１、２と双方向の機器制御通信線Ｌ３，Ｌ４で接続されたレシーバー１０と、備え付けのビデオ入力端子ＶinがレシーバーのビデオVoutとラインＬ５で結線されたテレビジョン受像機１５と、から構成され、前記テレビジョン受像機１５のテレビジョン画面１５Ｗに少なくとも１０行×２０列（２００文字）以上の文字配列を以て前記デジタル記録媒体の文字情報Ｓ１またはＳ２を所定の検索様式に従って表示するとともに、前記レシーバー１０を制御することによって前記再生装置１、２に収納されたデジタル記録媒体のＣＤやＭＤの文字情報Ｓ１、Ｓ２の検索と選択をテレビジョン画面１５Ｗの文字表示を見ながら行うようにしたシステム構成となっている。

【００２８】また、上記構成に加えてレシーバー１０は、テレビジョン画面１５Ｗを画面キーボードとしてレシーバー１０のリモコン装置（図示略）のカーソルキーによってテレビジョン画面１５Ｗを見ながら文字選択して前記再生装置１、２のメモリ装置３、４に文字入力するようにＣＰＵ（中央情報処理装置）７にて再生装置１、２に文字情報書き込みの命令を非同期式双方向通信ラインＬ１，Ｌ２を通して送り、再生装置１、２のＣＰＵ（中央情報処理装置）８、９はそのメモリ装置３、４または書き込み可能なデジタル記録媒体（典型はＭＤ）自身に前記文字情報Ｓ２を書き込むように制御する。

【００２９】尚、レシーバー１０内のメモリ装置６は実際上、ＣＰＵ７に内蔵のＲＡＭが使用される。

【００３０】尚、本システム３０においては１台のマスター機器であるレシーバー１０が複数のスレーブ機器である再生装置１（ＣＤプレーヤー）、再生装置２（ＭＤデッキ）を制御して、デジタル記録媒体の検索や文字入力をテレビジョン画面１５Ｗに表示された文字情報を見ながら容易に行うことができるように構成されている。

【００３１】尚、上記非同期式双方向通信ラインＬ１，Ｌ２及び双方向の機器制御通信線Ｌ３，Ｌ４は共に接地線と文字情報通信線ないし機器制御通信線の２本からなるケーブルであり（尚、Ｌ１とＬ３、Ｌ２とＬ４は一つのケーブルに纏めることが可能）、機器制御通信線Ｌ３，Ｌ４で行う通信は再生装置への再生、停止等の命令または再生装置からの機器状態情報の入手に使用される。また、文字情報の読み込み／書き込み関係の命令は全て上記非同期式双方向通信ラインＬ１，Ｌ２で行われ、そのデータ送受信は従来の非同期式双方向通信と同様である。

【００３２】因に本発明では上記のように機器間の通信ラインに汎用のケーブルが使用できるので、パーソナルコンピュータの表示画面を利用するよりもコスト的に有利であり、パソコンと接続してソフトウェアを起動させるといった繁雑な作業が不要なので便利である。つまり、パーソナルコンピュータ画面利用よりも普及率が圧

例的に高いテレビジョン画面の利用の方が遥かに汎用性に優れるのである。

【００３３】以下、上記テレビジョン画面への文字情報の表示例を図２を基に説明する。

【００３４】図２には１２行×２４列（最大２８８文字）の文字表示のテレビジョン画面１５Ｗに表示された再生装置１のＣＤプレーヤーから選択されたＣＤのディスク情報とトラック情報が同時に表示されている。

【００３５】１行目：　音源（ＳＯＵＲＣＥ）がＣＤであることを示す。

【００３６】２行目：　アイコン∧（この行が選ばれた場合、∧だけ反転する。）ＳＥＴを押されたら、ＤＩＳＣバックＳＫＩＰをする。

【００３７】３行目：　ディスク番号と行為者（ＰＥＲＦＯＲＭＥＲ）を表示する。例えば図では１９６番のＣＤであり、歌手の最初の１３文字がＭｉｃｈａｅｌＪａｃｋｓであることが表示されている。

【００３８】この行が選ばれた場合、行全体を反転させ、１０行目右に《》：ＭＯＤＥを表示する。（ＣＤ－ＴＥＸＴディスクのみ）

１１行目をＳＥＴ：ＰＬＡＹと表示し、押されたらそのディスクを再生する。（通常、１１行目はＳＥＴ：ＯＰＥＲＡＴＥと表示）

文字が１３文字より長い場合は、１文字づつ左へスクロールし、最後までいったら、最初の１３文字を表示する。

【００３９】ＭＯＤＥキーが押されたら、３行目でＤＩＳＫ　ＴＩＴＬＥ→ＰＥＲＦＯＲＭＥＲ→ＧＥＮＲＥ→ＳＯＮＧＷＲＩＴＥＲ→ＣＯＭＰＯＳＥＲ→ＡＲＲＡＮＧＥＲ→ＭＥＳＳＡＧＥをトグルし、４行目に情報を表示する。情報なしのディスクでは、「ＮＯ　ＤＡＴＡ」と表示する。

【００４０】４行目：　アイコン∨と、初期状態ではディスクタイトルを表示する。

【００４１】この行が選ばれた場合、∧だけ反転する。ＳＥＴを押されたら、ＤＩＳＣ前ＳＫＩＰをする。

【００４２】５行目：　アイコン∧（この行が選ばれた場合、∧だけ反転する。）

ＴＲＡＣＫ１からスタートする時は、表示しない。

【００４３】ＳＥＴを押されたら、ＴＲＡＣＫバックＳＫＩＰをする。

【００４４】６行目：　黄色でカレントのトラック番号とトラックタイトルを表示する。

【００４５】この行が選ばれた場合、行全体を反転させ、１０行目右に《》：ＭＯＤＥを表示する。（ＣＤ－ＴＥＸＴディスクのみ）

１１行目右をＳＥＴ：ＰＬＡＹと表示し、押されたらそのトラックを再生する。

【００４６】文字が１３文字よりも長い時は、１文字づつ左へスクロールし、最後までいったら最初の１３文字を表示する。

【００４７】ＭＯＤＥキーが押されたら、その行のみで、ＳＯＮＧ　ＴＩＴＬＥ→ＰＥＲＦＯＲＭＥＲをトグルする。

【００４８】情報なしのディスクでは「ＮＯ　ＤＡＴＡ」を表示する。

【００４９】７、８行目：　カレントトラックの次とその次のトラック番号とトラックタイトルを表示する。

【００５０】残りトラックが３つになったら、９行目の矢印を消す。

【００５１】残りトラックが１つ又は２つになったら、以降の行は「ＴＲＡＣＫ　：」のみ表示する。

【００５２】９行目：　アイコン∨（この行が選ばれた場合、∨だけ反転する。）

トラック送りをされた時は、１個スクロールさせる。

【００５３】１０行目：　この部分が選ばれたら、ＳＥＡＲＣＨだけを反転し、ＳＥＴキーを押されたらＳＥＡＲＣＨ画面へ行く。

【００５４】１１行目：　この部分が選ばれたら、ＵＳＥＲＦＩＬＥだけを反転し、ＳＥＴキーを押されたらＵＳＥＲＦＩＬＥ画面へ行く。

【００５５】１２行目：　この部分が選ばれたら、ＴＩＴＬＥ　ＩＮＰＵＴだけを反転し、ＳＥＴキーが押されたらＴＩＴＬＥ　ＩＮＰＵＴ画面へ行く。

【００５６】ＥＸＩＴでレシーバーのＭＡＩＮ　ＭＥＮＵへ行く。

【００５７】このように本システムでは１２行×２４列の文字表示のテレビジョン画面でディスク情報とトラック（曲）情報を同じ画面に表示することで、ユーザーは繁雑な作業を繰り返すことなく、容易に素早く希望のトラックを誤操作なく検索できるのである。尚、上記１２行×２４列の文字配列は１例であって、発明者の試作では少なくとも１０行×２０列の文字配列があれば上述の検索の容易性は実現される。勿論、ＣＰＵ７の性能を上げて上記例以上の文字配列を実現してもよい。

【００５８】次に、文字入力を行う手法としては、従来は英大文字（２７文字）、英小文字（２７文字）、数字（１０文字）、記号（約２０文字）それぞれを順送りして選択させる方法が一般的であったが、本発明では図３や図４に示されるようにテレビジョン画面を利用して画面キーボードを構成し、レシーバー１０のリモコン装置のカーソルキー（左右上下の方向指示ボタン）の簡単な操作によりテレビジョン画面を見ながら文字選択する。これにより文字入力を簡単且つ確実に行うことができることは明らかであろう。

【００５９】次に、本システム３０においては、特に再生装置１がデジタル記録媒体のコンパクト・ディスクの複数枚再生装置（所謂ＣＤチェンジャー）であり、レシーバー１０は前記再生装置１のメモリ装置３に書き込まれた全コンパクト・ディスクのＣＤテキスト情報を読み

出して自身のメモリ装置６に書き込むとともにこのＣＤテキスト情報に含まれるパーフォーマー（演奏者）名とディスクタイトル名とジャンル名の３つの項目から１つを選択して検索する検索手段を有する。

【００６０】例えば、図５に示される検索方法選択画面から判るように、ＣＤチェンジャー（ＣＤ２００枚収納）から１枚のＣＤを検索するには、希望のＣＤを検索する方法として、ＰＥＲＦＯＲＭＥＲ（演奏者）、ディスクタイトル（アルバム名）、ジャンルの３つから１つを選択する。

【００６１】図５のように⇒⇒演奏者から検索する方法を選んだ場合、図６に示されるように演奏者の最初の１文字（ＦＩＲＳＴ　ＣＨＡＲＡＣＴＥＲ）を画面キーボードからカーソルで入力する。

【００６２】また、図７に示されるようにディスク名から検索する方法を選んだ場合、同様にディスク名の最初の１文字を入力する。

【００６３】また、図８に示されるようにジャンルから検索する方法を選んだ場合、表示された５つのジャンル表示（無い場合は上下スクロールする）の中から１つを選択する。

【００６４】尚、ジャンルはＣＤテキスト情報では、「ADULT CONTEMPORARY, ALTERNATIVEROCK, CHILDRENS MUSIC, CLASSICAL, COUNTRY, DANCE, EASY LISTENING, EROTIC, FOLK, GOSPEL, HIP HOP, JAZZ, LATIN, MUSICAL, NEW AGE, OPERA, OPERETTA, POP MUSIC, RAP, REGGAE, ROCK MUSIC, RHYTHM EFFECTS, SOUND EFFECTS, SOUNDTRACK, SPOKEN WORD, WORLD MUSIC」の中の１つが充てられている。

【００６５】図９は上記演奏者の検索方法を選択して最初の１文字に「A」を入力した時の検索結果の画面表示例であるが、このように演奏者で検索した時は先ず演奏者の一覧を表示し、モード切換でディスク名を表示することもできる。この時、複数枚のディスクの情報を１画面に表示するようにしたので、１画面上に１枚のディスクの情報しか表示されないものに対して、大幅に検索効率が向上することになる。また、カーソルを移動させて希望のディスクを選択し、ＳＥＴキーを押すことによりそのディスクを再生開始できる。

【００６６】ディスク名、或いはジャンルで検索した時は先ずディスク名の一覧を表示し、モード切換で演奏者名を表示することができる。

【００６７】このように、数百枚の収納力を有するＣＤチェンジャーでは一般的に希望のディスクを探すのは容易ではないが、従来の再生装置はディスク名の羅列から検索を行う機能はあったが、１００枚を超すような枚数から探すのは時間を要したのである。本発明では３種類の検索方法からユーザーが任意に検索方法を選んでテレビジョン画面を見ながら検索を行う方式なので、検索の選択の幅が広がり、希望ディスクをユーザーの検索し易い方法で短時間で検索することが可能になる。

【００６８】念のために付言すれば、従来のＡＶ機器においては、数種のデジタル記録媒体の再生装置数台をシステムに含ませてこれら全ての検索、文字入力の操作をテレビジョン画面を表示装置として利用しつつ行うという発想は未だ生まれていなかったのである。

【００６９】

【発明の効果】以上説明したように、本発明に係るテレビジョン画面を利用したデジタル記録媒体の文字情報制御システムは、

（１）ＣＤ、ＭＤ等のオーディオ分野において、デジタル記録媒体における文字情報２００文字以上を同時にテレビジョン画面に表示できるので、検索されたＣＤ、ＭＤ等のデジタル記録媒体のディスク情報とトラック情報が同時に表示される等の多くのデジタル記録媒体の文字情報を表示することができ、文字情報の確認と選択が素早く容易にできるという優れた効果がある。

【００７０】（２）再生装置のメモリ装置ないし書き込み可能なデジタル記録媒体への文字情報の入力がテレビジョン画面に映し出された画面キーボードを見ながら容易に行えるという優れた効果がある。

【００７１】（３）既存のビデオ入力端子を有するテレビジョンをそのまま文字情報の表示装置として利用でき、複数のＡＶ機器のデジタル記録媒体の文字情報制御を全てテレビジョン画面を見ながら行うトータルシステム化が実現するという優れた効果がある。

【００７２】（４）多数枚のＣＤの検索手段がＰＥＲＦＯＲＭＥＲ（演奏者）、ディスクタイトル（アルバム名）、ジャンルの３つから選択できるので、ユーザーは希望ディスクをユーザーの検索し易い方法でテレビジョン画面を見ながら短時間で検索することが可能になるという優れた効果がある。

【図面の簡単な説明】

【図１】本発明に係るテレビジョン画面を利用したデジタル記録媒体の文字情報制御システムの構成を示すブロック図である。

【図２】本発明に係るテレビジョン画面に表示されたＣＤプレーヤーから選択された１枚のＣＤの文字情報（ディスク情報、トラック情報）を同時に表す表示画面の例である。

【図３】本発明に係るテレビジョン画面を画面キーボードとして文字入力する際の表示画面の例である。

【図４】本発明に係るテレビジョン画面を画面キーボードとして文字入力する際の表示画面の例である。

【図５】本発明に係る多数枚ＣＤチェンジャーの中から希望ディスクを検索する検索方法を設定する初期検索画面の例である。

【図６】本発明に係る多数枚ＣＤチェンジャーの中から演奏者名から検索する場合の検索画面の例である。

【図７】本発明に係る多数枚ＣＤチェンジャーの中から

希望ディスクのディスクタイトル名から検索する場合の検索画面の例である。

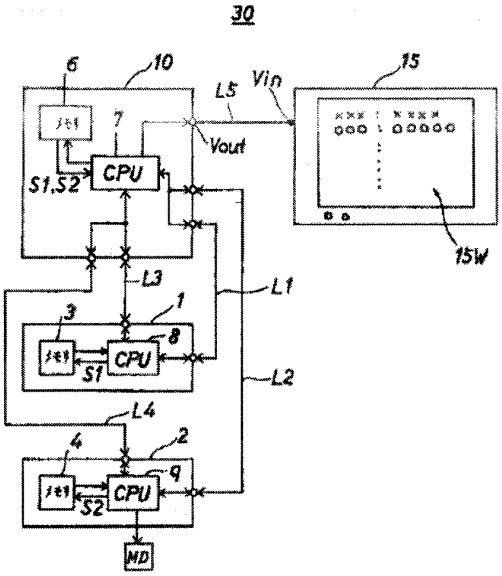
【図８】本発明に係る多数枚ＣＤチェンジャーの中から希望ディスクが属するジャンル名から検索する場合の検索画面の例である。

【図９】演奏者名から検索した場合の検索結果を表す表示画面の例である。

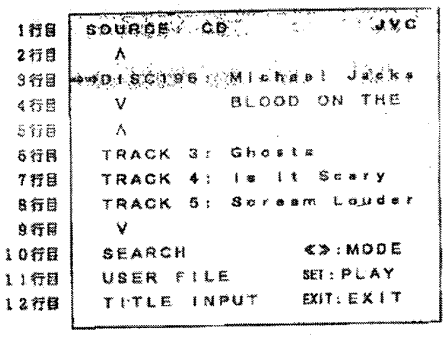
【符号の説明】

１　　再生装置（ＣＤプレーヤーまたはＣＤチェンジャー）
２　　再生装置（ＭＤデッキ）
３、４、６　　メモリ装置
７、８、９　　ＣＰＵ
１０　　レシーバー
１５　　テレビジョン受像機
１５Ｗ　　テレビジョン画面
３０　　文字情報制御システム
Ｌ１、Ｌ２　　非同期式双方向通信ライン
Ｌ３，Ｌ４　　双方向の機器制御通信線
Ｌ５　　ライン
Ｓ１、Ｓ２　　文字情報
Ｖｏｕｔ　　ビデオ出力端子
Ｖｉｎ　　ビデオ入力端子

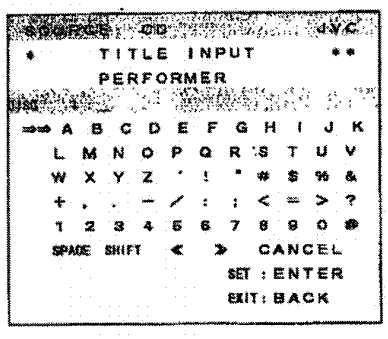
【図１】



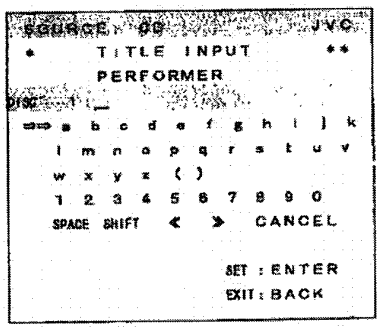
【図２】



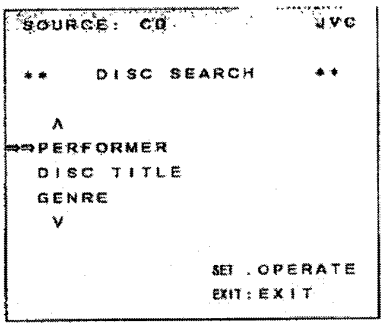
【図３】



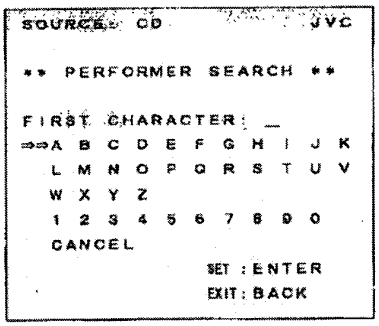
【図４】



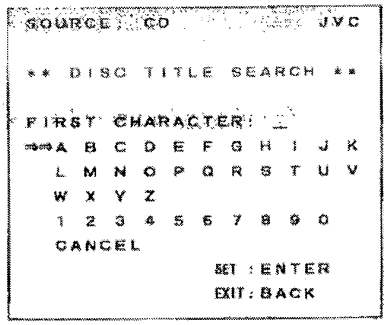
【図5】



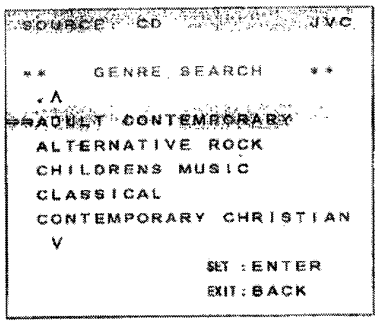
【図6】



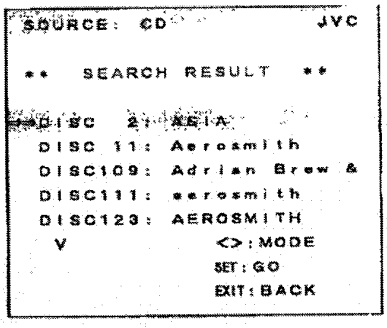
【図7】



【図8】



【図9】



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Certification of Translation

COMMONWEALTH OF MASSACHUSETTS
COUNTY OF MIDDLESEX

On this day of March 18, 2009

J. Bart Holladay

of The Legal Translating Service, a division of Linguistic Systems, Inc., 201 Broadway, Cambridge, Massachusetts 02139, being duly sworn, declared that the attached translation has been made faithfully of his own knowledge by himself and that the attached translation is a true and correct English version of the original Japanese document, Japanese Patent No. 2901445, to the best of his knowledge and belief.

His qualifications as a translator include familiarity with English as a native language, 7 years residence in Japan speaking and writing Japanese fluently, and 18 years of business experience with US and Japanese companies. Duties included translation and interpreting for internal and public purposes. Additionally he is employed as a freelance translator by Linguistic Systems, Inc.

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On this, March18, 2009, before me, the undersigned notary public, personally appeared, Hugh McAden Oechler proved to me through satisfactory evidence of identification, which was personal knowledge of identity, to be the person whose name is signed on this document above, and acknowledged to me that he signed it voluntarily for its stated purpose.

Lata Sujanani
Notary Public
My commission expires March 7, 2014

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COMMONWEALTH OF MASSACHUSETTS
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On this day of March 18, 2009

Dana Morris

of the Legal Translating Service, a division of Linguistic Systems, Inc.,130 Bishop Richard Allen Drive, Cambridge, Massachusetts 02139, being duly sworn, declared the attached translation to have been made faithfully of his own knowledge by himself and that the attached translation is a true and correct English version of the original Japanese document, Unexamined Patent Application No. H11-317061, to the best of his knowledge and belief.

His qualifications as translator include familiarity with English as a native language and with Japanese as an acquired language, and with said languages as languages of instruction and use for more than 12 years, and that he received a Ph.D. degree from the University of California and that he is employed as a freelance translator by Linguistic Systems, Inc.

Hugh McAden Oechler
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Translator' s Signature

On this, March 18, 2009, before me, the undersigned notary public, personally appeared Hugh McAden Oechler, proved to me through satisfactory evidence of identification, which was personal knowledge of identity, to be the person whose name is signed on this document above, and acknowledged to me that he signed it voluntarily for its stated purpose.

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Notary Public
My commission expires March 7, 2014

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Continued on last page

(54) [Title] Mini-Disk Recording/Playback Device

(57) [Claim(s)]

[Claim 1] The invention establishes working data for performing U-TOC (User's Table of Contents) operation separate from the RAM on which U-TOC information is stored within the mini-disc. It includes RAM on which is stored virtual execution result data, playback level, and an image processing device. The mini-disc recording and playback device makes it possible to display actual U-TOC information, virtual execution data, and playback levels on a graphic display and to carry out U-TOC operation using a graphic display.

[Detailed Description of the Invention]

[0001] [Industrial Application] Specifically this invention relates to the display of U-TOC (User's Table of Contents) information from a mini-disc recording and playback device.

[0002] [Description of the Prior Art] Some audio components, for example, a CD player, videocassette recorder, and visual equipment, have used a TV screen for operation or the display of playback status. Since the TV screen displayed a complicated configuration and operation intelligibly it had become a very effective means of display.

[0003]On the other hand, in a mini-disc recording and playback device, as shown in drawing 26 (a), the operation key 2 of the display 10 and a key input device are arranged on the front panel. The device is operated by the operation key 2, and the device playback and recording status information and U-TOC (User Table of Contents) data are shown on the display 10.

[0004] Namely, as shown in drawing 26 (b), the mini-disc recording and playback device is comprised of the mini-disc record playback unit 9, the controller 5, the key input device 2, RAM for TOC data storage 6, and the display 10. According to the commands executed from the key input device 2, the controller 5 operates the mini-disc record playback unit 9, and disk TOC and U-TOC reading as well as disk recording and playback are performed.

[0005] The TOC and U-TOC data read from the disk are stored in TOC RAM (6) and a part of the contents are displayed on the display (10) with the disk address information etc.

[0006] The display (10) only displays characters and figures in a fixed form. The data are not able to be expressed so that complicated U-TOC information could be understood at a glance.

[0007] [Problem(s) to be Solved by the Invention] In view of the above-mentioned point the purpose of the invention is to provide a mini-disc recording and playback device with easy operation and display of U-TOC data. This is accomplished by intelligibly managing the detailed recorded music information in the U-TOC area and taking advantage of the graphic display feature.

[0008] [Means for Solving the Problem] The invention establishes operation data for the mini disk recording and playback device to perform U-TOC operation separate from the RAM on which the mini- disk U-TOC information is stored. An image processing device is deployed to access the RAM that contains the virtual execution result data and playback levels. It makes it possible to display actual U-TOC information, virtual execution result information and playback levels on a graphic display and to carry out U-TOC operation using a graphic display.

[0009] [Function]In the mini-disc (MD) known as a rewritable magneto-optical disc, recordable area is established in the outside sector of the pit information recording area (TOC) on the inner circumference. There is a U-TOC area (U-TOC) and a program area in recordable area, the groove (slot) is engraved instead of there being no pit here and information is recorded along this groove.

[0010] The groove is surging to the waveform, and rotation of a disk is controlled so that the average frequency of the signal produced by the wave (wobble) is set to 22.05 kHz. In this wobble, FM modulation is conducted from the absolute time (address information) recording start position and recording starts.

[0011]Recording is performed by magnetization of the magnetic film. That is, a magnetic film is heated by laser above a Curie point, and the magnetic field reversal signal is applied. When it cools the signal is recorded on the magnetic film as a change in the magnetizing direction. Such recording can be performed also in a section of the disc that has been previously recorded meaning that overwriting is possible.

[0012] Management of the recording position is performed using the information recorded in the U-TOC. A track number (TNO) is given to record a program area for every music track as a continuation of natural numbers starting at 1. All of the information, including start time, end time, title, etc., is recorded for every TNO. If a TNO and its attached information are erased from U-TOC the section of the disc will be treated as a non-recorded section.

[0013] When the disc is loaded in the device U-TOC information will be read and the data is stored in the device work data RAM, and playback management is performed thereafter using U-TOC information stored in the U-TOC RAM. If music track is recorded or erased, the data stored in the RAM will be changed, but before the memory information is deleted from the disc in the device it is recorded on the disc U-TOC.

[0014] Thus, changing and erasing a disk TNO are possible for the management information is stored in the device RAM as U-TOC data. The mini-disc recording and playback device U-TOC virtual execution result data is stored in the RAM so that operational changes in disc management can be made. It is generated as a video signal and sent to a graphic display by an image processing device and is displayed so that errors can be prevented.

[0015]Since U-TOC information can be displayed in various modes during regular play, program play, and sound recording operation as well as during pause. Playback details can be monitored at a glance while under operation.

[0016]
[Example] The mini-disc recording and playback device in this invention is explained based on a drawing. The perspective view showing the composition of the mini-disc recording and playback device is shown in Fig. 1 (a), and Fig. 1 (b) shows the block diagrams of the configuration of the mini-disc recording and playback device.

[0017] The mini-disc recording and playback device is arrayed as shown in Fig. 1 (a) the key input device (2), the mouse (3), and the graphic display (4) are connected to the main part (1) of the mini-disc recording and playback device. A television can be used as the graphic display (4) although a CRT is used in the figure.

[0018] As shown in Fig. 1 b) in detail, the main part of a mini-disc recording and playback device is

comprised of the mini-disc recording and playback unit (9), the controller (5), RAM (6) for TOC data storage, work data memory RAM (7), and the image processing device (8). The controller (5) receives instructions from the key input device (2) to operate the mini-disc recording and playback unit (9) and read the disc TOC and U-TOC in order to perform recording and playback.

[0019] TOC and U-TOC are read from the disc and include disc type (prima-starred, recordable or hybrid), recording laser power, sector indicator in use, lead-out start address, track (start address, end address) track mode (mono, stereo, an emphasis, a distinction that a copyable or not, disk name, track name, sound recording time minute, second, and a link pointer (address initial entry), and the data is stored in TOC data storage RAM (6).

[0020] The contents stored in TOC data storage RAM (6) can be modified using the key input device (2) or the mouse (3) to manipulate the operation data stored in the operation data RAM (7) . During modification the data stored in TOC data storage RAM (6) and operation data RAM (7) is converted into a video signal by the image processing device (8) and displayed on the graphic display (4).

[0021]The display item and display mode on the graphic display 4 are specified with the key input device 2. The display example is explained with reference to Fig. 2 thru/or Fig. 17 below. The screen shown in Fig. 2 is a display example of TOC data being arranged during playback and playback pause.

[0022] Field A shows the title of the display information on screen. The center section is a data table displaying the album title on the B column, and the recording date information is displayed on the C column. On the bottom the TNO data table is displayed showing stop time, run time, and sound recording time. TNO (4) indicated by arrow E is a track in playback or pause mode displayed in a different color or flashing. The track and time in playback or pause are shown in the lower D column.

[0023] The screen shown in Fig. 3 is a display example of modes other than playback or pause, and shows the data position of each TNO diagrammatically. The TNO data is expressed in rows corresponding to the address, and the length of the row is proportional to data volume (time). The TNO data is listed vertically in order of TNO, and it is shown and corresponds with a data position so that the user can understand the TNO. Data is reproduced from right to left in the graphic display. The address (a start value, an end value, length) is numerically shown in the column on the left-hand. Although TNO in playback or pause place is shown by the arrow E as in Fig. 2, it is further indicated by the vertical bar F.

[0024]Although Fig. 4 shows the same expression as Fig. 3, the TNO data 6 is recorded at intervals in this case, and that displayed band serves as an island shape. Although TNO 6 is broken in three parts and each division is connected by the link pointer, the playback sequence is not shown. What is shown is that the TNO data playback order 6 is a display mode shown in Fig. 5. In Fig. 5 a data position (island) shifts to the division numerical order of TNO 6 downward, it is shown in it, and playback is performed in order from high (island) to low (island).In Fig. 5 the address (a start value, an end value, length) is divided by track.

[0025]The screen shown in Fig. 6 is a display example of programming set up of the playback order. The source data to be program edited is shown on the right-hand side, and the data being programmed or having been programmed is shown on the left-hand side, and therefore both sets of data can be

viewed.

[0026] Fig. 7 shows the screen during program playback. A data table is displayed in the order of the program (playback order) which is the original TNO order. The display of the present playback position is similarly indicated for a track in playback or pause.

[0027] Fig. 8 shows sound recording, sound recording pause, and the source monitor screen. Additionally shown within the display are input source (digital / analog), record level position, level meter, record margin, the state of sound recording options, with indicators for the attenuator function, TNO automatic change, and manual change recording functions are also displayed.

[0028] The current recording position is displayed by the vertical bar E, and the recorded portion and remainder to be recorded are distinguished by a color differentiation or flash. Therefore it is possible to visually display the remainder to be recorded.

[0029]The screen shown in Fig. 9 diagrammatically shows the data position of each TNO during recording. The method of display is the same as the method shown in Fig. 3. The end position display (G in the figure) of the address/time of the track is counted to compensate for real operation during sound recording, and the row (H in the figure) of data is extended. The row of data being recorded flashes. Although as in Fig. 4 having shown that the recorded data which is immediately preceding in the disc recording process history of the recorded data can be viewed.

[0030] Figure 10 shows the TNO rewriting screen . A new TNO can be set up by using this screen to check the data content. New TNO setup is performed by inputting a number corresponding to the existing TNO. Input is performed by cursor positioning and key input.

[0031] During TNO setup the user can work with knowledge of the modified setup on the speculative execution result screen shown in figure 11. It is performed by inputting an execute command to write the work data RAM to the TOC data storage RAM to complete setup of the new TNO.

[0032] Figure 12 shows the TNO erase screen. When a TNO is directed to be erased its display color changes or it flashes. Multiple tracks can be erased or if ALL is selected all tracks will be erased.

[0033] On the screen in Fig.12 a track is set up to be erased or rewritten and U-TOC data can be rewritten by inputting an execute command. The rewritten program is shown in Fig. 13. Erase track setup can be continued on the screen in Fig. 13.

[0034] Figure 14 shows the TNO erase and rewrite screen for doing rewrite work simultaneously. The setup and performance methods are the same as the TNO erase and rewrite mentioned above. User can know the status after track replacement from the speculative execution screen shown in figure 15.

[0035] Figure 16 shows the TNO start/end address reassignment screen . When key designation is carried out specifying the disc position playback data will be incorporated focusing on the TNO start /

end address positions near the specified position and a time-level chart will be displayed including the current start and end address positions.

[0036] Shifting start and end address positions can be performed with the screen key commands moving the address-position index (indicated by J and K in the figure). The address value after movement is computed by converting the movement magnitude on screen into an address value and is written to the operating data RAM.

[0037] The user can work while looking at a level envelope. After playback of data from the operating data RAM and checking song timing with the rehearsal function, the start and end address position can be shifted.

[0038] Figure 17 shows the add TNO screen. The position is specified by key entry and playback data will be input into the specified position. Then a time-level chart is displayed.

[0039] Start address position shift work is performed by moving the start address position index (shown by K in the figure) on screen by key operation. The address value after movement is computed by converting the movement magnitude on screen into a new address value and is written to operating data RAM.

[0040] The user can work while looking at a level envelope. After playback of data in operating data RAM and checking song timing with the rehearsal function, the added TNO start address can be set.

[0041] Figure 18 shows another example of this invention. In this case, the small display is built into the mini-disc recording and playback device, and various operations and displays can easily be carried out at one time.

[0042] Figure 19 shows another example of this invention. In this case the commander and the remote control are included in the diagram and various operations and displays are possible using the remote control or commander.

[0043] Figure 20 shows another example of this invention. In this case, it can work using a PC keyboard and display connecting the input/output port of a personal computer to the data interface provided in the mini-disc recording and playback device. Operation software is installed (floppy disk stored data) in the personal computer.

[0044] Figure 21 shows another example of this invention. In this case, by connecting the input/output port of a home video game machine to the data interface of the mini-disc recording and playback device same as was the case in Fig. 20 and installing operation software (the ROM cassette storage data) into the home video game machine it can be operated using the home video game machine keys and a TV screen.

[0045] Figure 22 shows another example of this invention. In this case, it is configured with an AV amplifier and the corresponding display of audio equipment separate from the mini-disc recording and

playback device is also managed synthetically. In doing so various input and display functions are made operational.

[0046] Figure 23 shows another example of this invention. In this case the MD changer is configured with the mini-disc recording and playback device. Information from multiple disks is managed making possible package display etc. Data from multiple programs can be edited on one screen.

[0047] Figure 24 shows another example of this invention. In this case character input is performed with the display screen keyboard. Character input can be performed by mouse in a system configuration without a keyboard.

[0048] Figure 25 shows another example of this invention. In this case, a print function is added to MD display system. Figure 25 (a) shows the case where a printer is connected to the key input device and display system. When a word processor is connected to the MD recording and playback device as shown in drawing 25 (b) the keyboard, display, and printer with software can be used to facilitate input. It becomes possible to create and edit a program list, a cassette index, etc. by printing out the contents.

[0049] [Effect of the Invention] The mini-disc recording and playback device in this invention enables various information acquired from the disk to be intelligibly expressed on a graphic display screen.

[0050] Information in the figure, such as time, data length, a track position, and a recording level, can be expressed visually and the operating data and system state can be easily understood for effective mini-disc function utilization.

[Brief Description of Drawings]

[Figure 1] The perspective view showing the composition of the mini-disc recording and reproducing device whose fig. 1 (a) is an example of this invention, and Fig. 1 b) are the block diagrams showing the composition of the mini-disc recording and reproducing device.

[Figure 2] The figure shows an example of the display screen of the mini-disk recording and playback device

[Figure 3] The figure shows an example of the display screen of the mini-disk recording and playback device

[Figure 4] The figure shows an example of the display screen of the mini-disk recording and playback device

[Figure 5] The figure shows an example of the display screen of the mini-disk recording and playback device

[Figure 6] The figure shows an example of the display screen of the mini-disk recording and playback device

[Figure 7] The figure shows an example of the display screen of the mini-disk recording and playback

device.

[Figure 8] The figure shows an example of the display screen of the mini-disk recording and playback device.

[Figure 9] The figure shows an example of the display screen of the mini-disk recording and playback device.

[Figure 10] The figure shows an example of the display screen of the mini-disk recording and playback device.

[Figure 11] The figure shows an example of the display screen of the mini-disk recording and playback device.

[Figure 12] The figure shows an example of the display screen of the mini-disk recording and playback device.

[Figure 13] The figure shows an example of the display screen of the mini-disk recording and playback device.

[Figure 14] The figure shows an example of the display screen of the mini-disk recording and playback device.

[Figure 15] The figure shows an example of the display screen of the mini-disk recording and playback device.

[Figure 16] The figure shows an example of the display screen of the mini-disk recording and playback device.

[Figure 17] The figure shows an example of the display screen of the mini-disk recording and playback device.

[Figure 18] It is another example of this invention in a figure showing the composition of the mini-disc recording and playback device.

[Figure 19] It is another example of this invention in a figure showing the composition of the mini-disc recording and playback device.

[Figure 20] It is another example of this invention in a figure showing the composition of the mini-disc recording and playback device.

[Figure 21] It is another example of this invention in a figure showing the composition of the mini-disc recording and playback device.

[Figure 22] It is another example of this invention in a figure showing the composition of the mini-disc recording and playback device.

[Figure 23] The perspective view showing the composition of the mini-disc recording and reproducing device whose figure 23 (a) is an example of further others of this invention, and figure 23{

HYPERLINK "http://www4.ipdl.inpit.go.jp/cgi-bin/tran_web_cgi_ejje?u=http%3A%2F%2Fwww4.ipdl.inpit.go.jp%2FTokujitu%2Ftjitemdrw.ipdl%3FN0000%3D239%26N0500%3D1E_M%2F%3F%3F%3D6%3F>%3B%3B%3A%2F%2F%2F%26N0001%3D26%26N0552%3D9%26N0553%3D000024" \n _blank}(b) are the figures showing the example of a screen display of the mini-disc recording and playback device.

[Figure 24] It is a figure showing the example of a screen display of the mini-disc recording and playback device which is an example of further others of this invention.

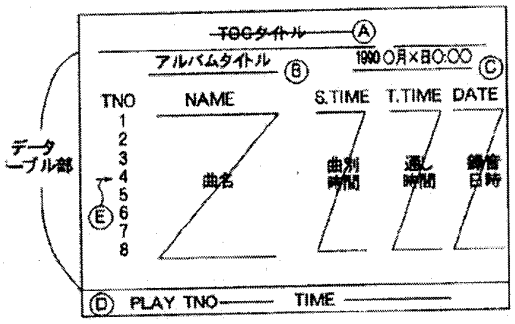
[Figure 25] The figure showing the composition of the mini-disc recording and playback device whose Fig. 25 (a) is an example of further others of this invention, and Fig. 25 (b) are the figures showing the composition of a variation of the example.

[Figure 26] The perspective view in which Fig. 26 (a) shows the example of the conventional mini-disc recording and playback device, and Fig. 26 (b) are block diagrams showing the composition of the mini-disc recording and playback device.

[Description of Notations]
1 The main part of a mini-disc recording and reproducing device
2 Key input device
3 Mouse
4 Graphic display
5 Controller
6 RAM for talk data storage
7 RAM for operating data storage
8 Image processing device
9 Mini-disc record reproduction unit
10 Display

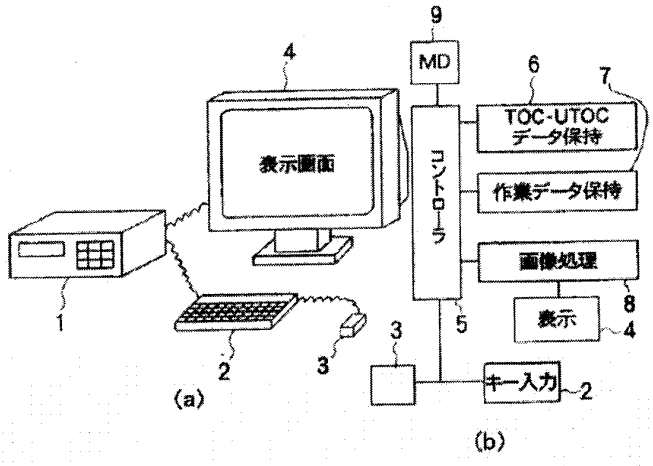
[Figure 2]
Data table
A-TOC Title
B-Album Title
C- 1990 ○month × day ○: ○ ○ time
Track name
Stop Time
Run time
Recording Date

【図2】



[Figure 1]
4-Display
5-Controllers
6-TOC-UTOC data storage
7-Operation Data storage
8-Image Processing Device
9-Key Input Device

【図1】

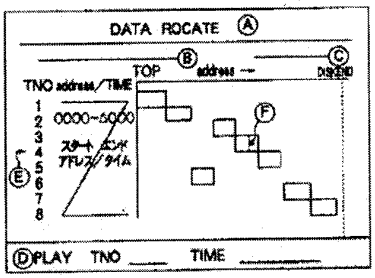


[Figure 3]

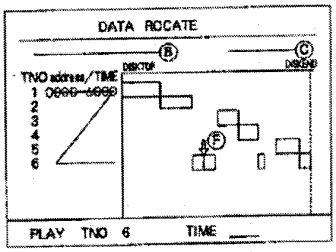
Start End
Address / Time

[Figure 4]

【図３】



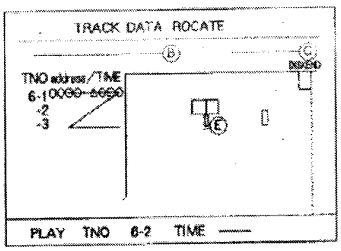
【図４】



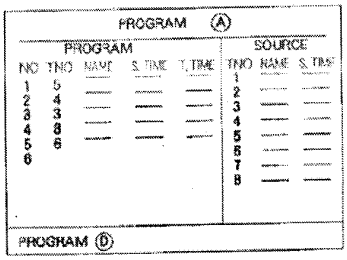
[Figure 5]

[Figure 6]

【図５】



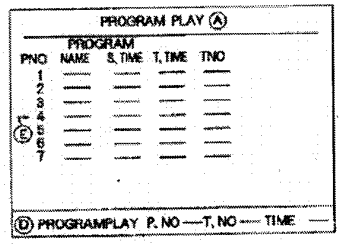
【図６】



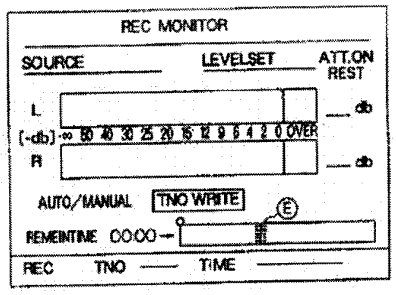
[Figure 7]

[Figure 8]

【図７】



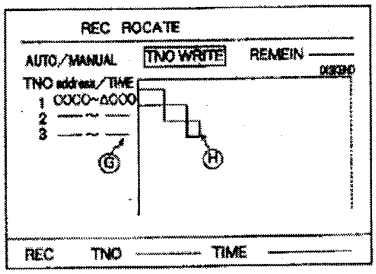
【図８】



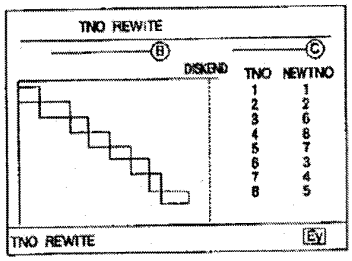
[Figure 9]

[Figure10]

【図９】

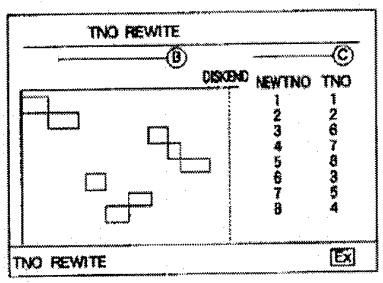

REC ROCATE
AUTO/MANUAL
TNO WRITE
REMEIN
TNO address/TIME
1 OOOO~ΔOOO
2
3
G
H
REC
TNO
TIME

【図１０】


TNO REWITE
B
C
DISKEND
TNO NEWTNO
1 1
2 2
3 6
4 8
5 7
6 3
7 4
8 5
TNO REWITE
EY

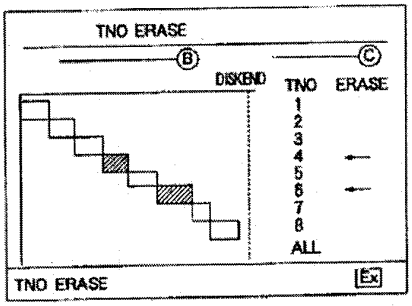
[Figure11]

【図１１】



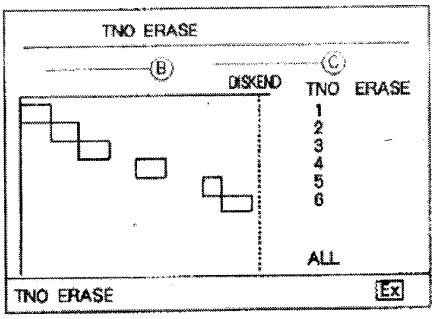
[Figure 12]

【図１２】



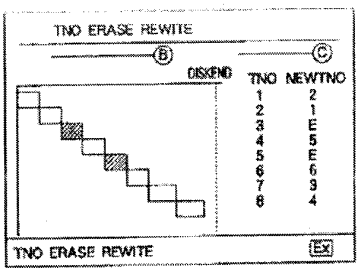
[Figure 13]

【図１３】



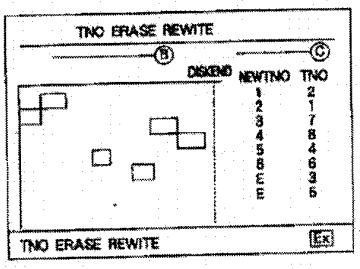
[Figure 14]

【図１４】



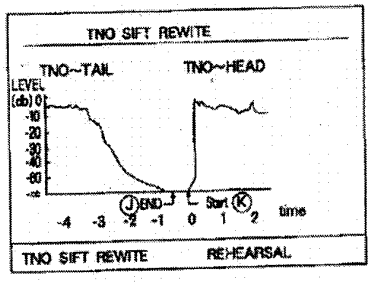
[Figure 15]

【図１５】



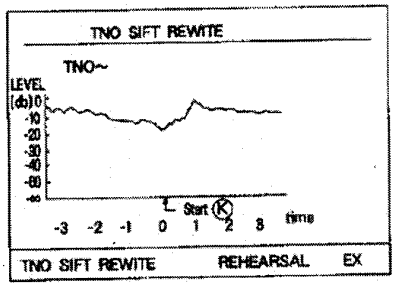
[Figure 16]

【図１６】



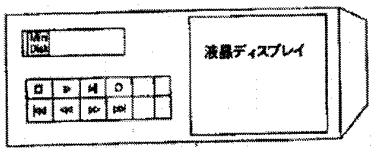
[Figure 17]

【図１７】



[Figure 18] LCD display

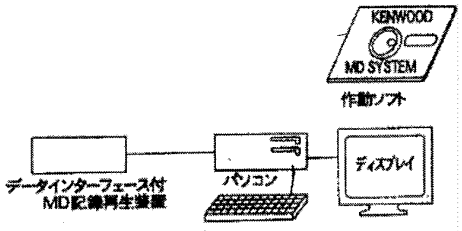
【図１８】



[Figure 19]
MD recorder
Display
Command
Remote Control

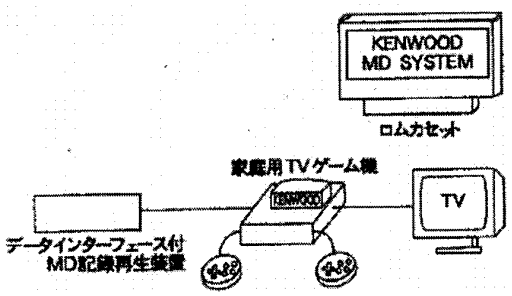
【図１９】

[Figure 20]
MD recording and playback device with a data interface
PC
Operating software
Display



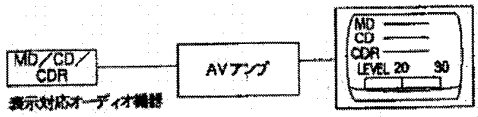
[Figure 21]
With data interface
MD recording and playback device
TV home games
ROM Casette

【図２１】



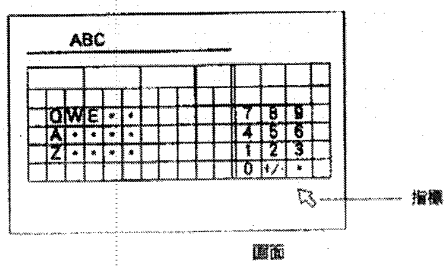
[Figure 22]
Audio display
AV Amplifiers

【図２２】



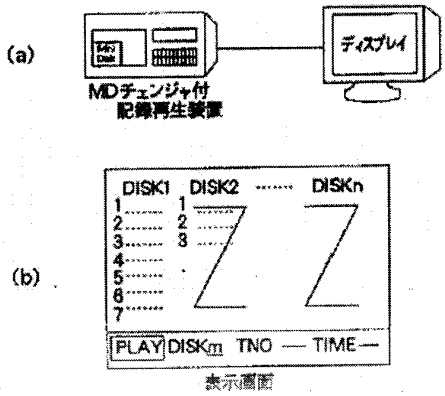
[Figure 24]
Screen
Indicators

【図２４】



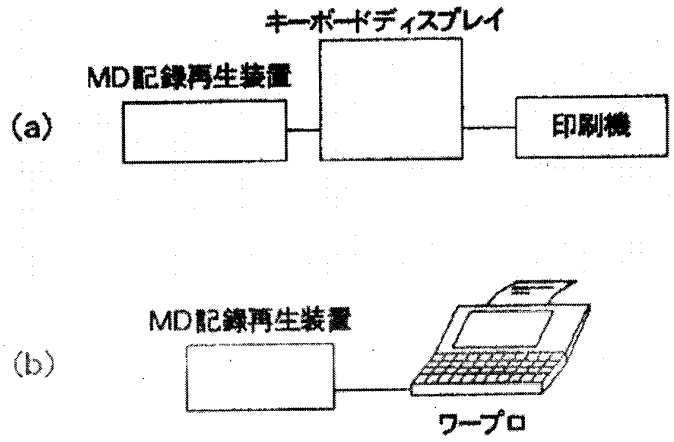
[Figure 23]
a-MD recording and playback device with changer
a-Display / b-Display Screen

【図２３】



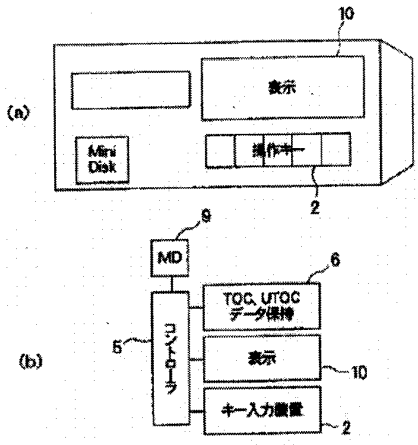
[Figure 25]
a-MD recording and playback device
a-Keyboard Display
a-Printing machine
b-MD recording and playback device
b-Word Processor

【図２５】



[Figure 26]
10-Display
2-Key operation
5-Controllers
6-TOC, UTOC data storage
10-Display
2-Key input device

【図２６】



Continued from the Front Page
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(58) fields of study (Int.Cl.6, DB)
G11B 27/00-27/34

Electronic Acknowledgement Receipt

EFS ID:	5470701
Application Number:	12015320
International Application Number:	
Confirmation Number:	2156
Title of Invention:	Method for Managing Media
First Named Inventor/Applicant Name:	Russell W. White
Customer Number:	21906
Filer:	Edwin E. Richards/STephanie Petreas
Filer Authorized By:	Edwin E. Richards
Attorney Docket Number:	AFF.0004C5US
Receipt Date:	08-JUN-2009
Filing Date:	16-JAN-2008
Time Stamp:	12:50:05
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

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11	Foreign Reference	DEF00012332.pdf	5758236 7f635a1f4992743cbdd76a2f71ebb1aad2bf39a9	no	40
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12	Foreign Reference	DEF00012372.pdf	3829358 a869dae3b7b12633e00f5cadf6b6b07738704fd7	no	34
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14	Foreign Reference	DEF00012431.pdf	1497889 519568f921f0464ca118af33f574749969a10c8d	no	19
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15	NPL Documents	DEF00012472.pdf	1699138 79acdc03b1d2a022326d522ac2a7ff13b09f42d2	no	8
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17	NPL Documents	DEF00012537.pdf	3873332 5cfd700184db3b37b2804e941640436f77c0576c	no	46
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18	NPL Documents	DEF00013944.pdf	6592161 086a0bcb18177a9b31ffdd1858b3cd6a6eab8a4c	no	48
Warnings:					
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19	NPL Documents	DEF00013992.pdf	21707254 62f2afe9c274dc47bab08e67958a62a76be29755	no	145
Warnings:					
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20	NPL Documents	DEF00014686.pdf	318310 457c35f5ba9781a3eb827961f78696290b2d87c8	no	2
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Examiner Name	Erika A. Gary
Attorney Docket Number	AFF.004C5US

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☐ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☐ None

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A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Mark J. Rozman/	Date (YYYY-MM-DD)	2009-06-08
Name/Print	Mark J. Rozman	Registration Number	42117

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	12015320
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	First Named Inventor	Russell W. White, et al.
	Art Unit	2617
	Examiner Name	Erika A. Gary
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(57) Abstract

An automobile information system facilitates communication within clusters of components and among various clusters. Each cluster has logically related automobile components (e.g., environment control components, entertainment components, etc.) interconnected to a cluster controller connected via a data communications bus. The cluster controller is responsible with disseminating information received from an external source and exchanging information between two or more components. The cluster controller is implemented as a general-purpose computing device having an open platform operating system, which supports multiple applications and provides interfaces to the components. The cluster controllers are interconnected via another data communications bus to enable information flow between clusters. In this manner, any component in one cluster can share information with any component in another cluster without need for dedicated wiring or specially written code.

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AUTOMOBILE INFORMATION SYSTEM

TECHNICAL FIELD

This invention relates to information systems for automobiles

BACKGROUND OF THE INVENTION

In traditional automotive electronic systems, dedicated components are employed to control specific functions in the vehicle. These dedicated components are typically independent of one another, each with its own operator interface. For instance, most modern automobiles have an electronic engine control system, a computerized antilock braking system (ABS), a vehicle safety system, a lighting control system, a climate control subsystem, and a sound system. Most vehicles also have power door locks, power windows, and power seating for the operator's comfort.

Some automobile models are equipped with a navigation system that employs a global positioning system (GPS) receiver to receive positioning signals from a satellite network. The navigation system computes coordinates that locate the vehicle over the surface of the earth with regard to longitude, latitude, and altitude. Cellular communication systems have also been introduced into automobiles to enable the driver or occupant to transact telephone calls from their vehicle. Most late model automobiles are also constructed with a diagnostic system that analyzes the performance of the automobile engine, air and heating system, and other components (1996 or later for OBD II, 1993 or later for OBD I).

While these various electronic control units have proven useful, there is a drawback in that all of them are entirely separate and independent from one another. Generally, different manufacturers supply these subsystems. These disparate components often employ proprietary, dedicated processors or ASICs (application specific integrated circuits) that have different system architectures and execute incompatible proprietary software. The components have limited or no communications with one another.

Yet, today's automotive electronic systems increasingly encompass a broader range of functionality, such as task management, resource management, communication with other control units or systems, time-critical monitoring and control of equipment. This requires increased integration of components into networks of distributed and multiplexed electronic system, as well as interfaces for communication between the control units and for communication with the operator. The motivations for this increased integration of the automotive electronic system are many, including:

- Cost reduction of existing functions;
- Cost effective improvement of existing functions;
- Cost effective enabling of new functions;
- Reduction of wiring weight;
- Simplify addition of new functions via software upgrade;
- Optimization of electronic and mechanical integration;
- Increase of system performance, intelligence, and coherent; and
- Increase data communications with external systems/infrastructure.

Some strides have been made to integrate the components. Typically, the proposals call for each of the distributed components to be connected to a data bus, such as a CAN (Controller Area Network) protocol bus. Designers have theorized different multiplexing protocols and token passing protocols to facilitate communication over the bus. For more information on these proposals, the reader is directed to the following articles which appear in a publication from the Society of Automotive Engineers (SAE): Inoue et al., "Multiplex Systems for Automotive Integrated Control," Multiplex Technology Applications in Vehicle Electrical Systems, SP-954, No. 930002, copyright 1993; Azuma et al., "Development of a Class C Multiplex Control IC," Multiplex Technology Applications in Vehicle Electrical Systems, SP-954, No. 930003, copyright

1993; Mathony et al. "Network Architecture for CAN," Multiplex Technology Applications in Vehicle Electrical Systems, SP-954, No. 930004, copyright 1993; Szydolowski, "A Gateway for CAN Specification 2.0 Non-Passive Devices," Multiplex Technology Applications in Vehicle Electrical Systems, SP-954, No. 930005, copyright 1993; Neumann et al., "Open Systems and Interfaces for Distributed Electronics in Cars (OSEK)," Automotive Multiplexing Technology, SP-1070, No. 950291, copyright 1995; and Emaus, "Aspects and Issues of Multiple Vehicle Networks," Automotive Multiplexing Technology, SP-1070, No. 950293, copyright 1995.

While there has been some progress at interconnecting electronic components in a distributed system via a communication link, there is no commonly accepted standard for the main vehicle system bus and bus interface. Achieving the above objectives entails a system design that is flexible and scaleable, with the capability to manage complex functions.

SUMMARY OF THE INVENTION

This invention concerns an automobile information system that facilitates communication within clusters of components and among various clusters. Each cluster has a controller that provides a platform for supporting many diverse components.

In one implementation, various automobile components are grouped into logical clusters. For example, components used to control an operator's environment in the automobile (e.g., climate control, lighting, seat position, window placement, door locks, etc.) might form a first cluster. Another cluster might contain components related to entertainment and communication functions (e.g., audio, navigation, cellular communications, etc.).

Each cluster has its own cluster controller to manage information flow among the cluster's components. A data communications bus interconnects the cluster controller and components. The cluster controller is responsible with disseminating information

received from external sources to the various components with interest in the information as well as exchanging information between two or more components within the cluster.

Each cluster controller is implemented, for example, as a general-purpose computing device having an open platform operating system. The operating system offers a platform with APIs (application program interfaces) and DDIs (device driver interfaces) that allow developers to interface different peripheral components with a common controller. The cluster controller supports multiple applications and provides interfaces for those programs to the hardware peripheral devices.

The cluster controllers are interconnected via another data communications bus to enable information flow between clusters. In this manner, any component in one cluster can share information with any component in another cluster without need for dedicated wiring or specially written code.

BRIEF DESCRIPTION OF THE DRAWINGS

The same reference numerals are used throughout the drawings to reference like components and features.

Fig. 1 is a diagrammatic illustration of a vehicle information and control system implemented in an automobile.

Fig. 2 is a block diagram of a cluster having a cluster controller to manage information flow among multiple components.

Fig. 3 is a block diagram of two clusters, with the cluster controllers interconnected to one another.

Fig. 4 is a block diagram of a cluster controller.

Fig. 5 is a block diagram of software architecture employed in the cluster controller.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

General System

Fig. 1 shows vehicle information system 20 constructed in an automobile 22. The automobile control system 20 has a master control unit (MCU) 24 and one or more secondary control unit (SCU) 26(1) and 26(2). A dual bus structure having a primary data communications bus 28 and a secondary support bus 30 provide an infrastructure for data communications in the control system 20. The primary bus 28 may be implemented using any vehicle bus design currently employed or contemplated by automobile manufactures, such as CAN, ABUS, VAN, J1850, K-BUS, P-BUS, I-BUS, USB, P1394, and so forth. The master control unit 24 can be configured as master of the primary bus 28. The support bus 30 may be implemented as any standard computer data bus, such as PCI, USB, P1394, and the like. One or both secondary control units 26(1) and 26(2) can be configured as master of the support bus 30 and as controller of one or more components coupled to the support bus 30.

The master control unit 24 and the secondary control unit(s) 26 are interconnected through the primary vehicle bus 28. In addition, various electronic automobile components are connected to the master control unit 24 via the primary bus 28. In this illustration, the electronic components include an antilock braking system (ABS) 32, an electronic steering system 34, and an engine control system 36. However, other components may likewise be connected to the primary vehicle bus 28, such as a security/alarm system, a diagnostic system, a lighting control system, a fuel injection system, an automatic transmission system, and so forth. In addition, the electronic components shown in Fig. 1 are intelligent components in that they each have their own local controller, typically embodied as a microprocessor. The automobile might further include non-intelligent electronic components that do not have local processing capabilities.

Fig. 1 shows a number of devices connected to the support bus 30. These devices include a climate control system 38, an audio system 40, a navigation system 42 with global positioning system (GPS) antenna 44, and a cellular communications system 46. The support bus 30 is also coupled to a wipers module 48, lighting control 50, power door locks 52, power window controls 54, and seat control 56. An SCU 26 may also be configured as a server to serve to multiple clients 58. The clients 58 can be implemented, for example, as small hand held or laptop game computers having visual display screens and audio sound cards to provide multimedia entertainment. The SCU 26 serves in-car entertainment in the form of movies and games to the clients 58 for the passengers' enjoyment.

The control units 24 and 26 can be arranged in two different architectures: (1) master/slave architecture; and (2) cluster architecture. In a master/slave architecture, the master control unit 24 acts as the master of the primary vehicle bus 28 and all electronic components 32-36, as well as the secondary control unit(s) 26, act as slaves to master control unit 24. The master control unit 24 manages data flow among the electronic components 32-36 and facilitates resource and information sharing. In addition, the master control unit 24 provides backup for the intelligent electronic components in the event that any of them fail, and also performs data processing and control functions for non-intelligent electronic components. This architecture is described in detail in U.S. Patent Application 08/771,343, entitled "Fault-Resilient Automobile Control System", which was filed December 16, 1996, and issued as U.S. Patent No. _____ on _____. This patent is assigned to Microsoft Corporation and is incorporated by reference.

Cluster Architecture

In a cluster architecture, the control units 24 and 26 (or the two secondary control units 26(1) and 26(2)) act as cluster controllers to control groups of related components.

For example, a cluster controller might provide control of lights, climate control system (heating, ventilation and air conditioning), windshield wipers, seat adjustments. Another cluster controller may provide more advanced features, such as access to vehicle diagnostic information, intelligent door lock, remote alarm/unlocking, and configurable instrument panel and head-up display. With a cluster controller, the functionality of the core subsystems can be greatly enhanced by sharing hardware resources and information among the components and subsystems. It also provides maximum flexibility and allows additional functionality to be added as new components to the system without having to redesign the entire system.

Fig. 2 shows an exemplary cluster architecture 60 in which one of the secondary control units 26(1) is configured as a cluster controller for the wipers module 48, lighting control module 50, door lock modules 52, power window control modules 54, and a seat control module 56. The cluster controller 26(1) facilitates information sharing among the cluster of components over bus 30. For example, suppose the vehicle operator sets the vehicle alarm system when exiting the vehicle. The vehicle alarm system informs the cluster controller 26 that the alarm is now activated. When the cluster controller 26 receives this notification, this single piece of information is shared among the components so that those components with interest may take some sort of action. Here, the lighting control module 50 may blink the interior lights to provide feedback to the operator that the alarm has been set. Concurrently, the door lock modules 52 and power window controls 54 are toggled to a locked state to prevent unwanted entry.

With the cluster architecture, multiple clusters can be interconnected via one or more data buses to communicate with each other. Communication between clusters enables increased functionality of the system and helps reduce cost, simplify information communication, and optimize functions.

In traditional prior art systems, dedicated wiring is required for one component to communicate with another component. Consider the example of adding a feature of

remote locking and unlocking of the vehicle doors via telephone or email. To perform this task, the traditional solution is to add wiring between the door lock control module 52 and communication module 46 to form a dedicated communication link. Then, special software is written to enable the communication module 46 to receive the instruction to lock the door and to send that instruction to the door look control module 52. Moreover, one or both of the modules needs to be adapted to communicate according to a specific protocol employed by the other.

In the clustering architecture, however, the communication link between the cluster controllers handles the communication between various components without need of special wiring or programming. Fig. 3 shows a cluster architecture 62 in which two clusters 64 and 66 are interfaced together. The first cluster 64 is the same as that shown in Fig. 2, with cluster controller 26(1) controlling the components related to the vehicle operating environment (e.g., wipers 48, door locks 52 and seat control module 56). The first cluster controller 26(1) interfaces with these components via bus 30.

A second cluster controller 26(2) controls the second cluster 66, which groups communication and entertainment functions. In this example, the second cluster controller 26(2) facilitates communication and information flow among the audio module 40, the navigation component 42, and cellular communications module 46. The second cluster also utilizes the bus 30, although a separate bus may be used.

The first and second cluster controllers 26(1) and 26(2) are connected via bus 28. The cluster controllers 26(1) and 26(2) facilitate communication flow between any component in the first cluster 64 and any component in the second cluster 66 over the second bus 28. The two cluster controllers 26(1) and 26(2) can utilize a common communications protocol to communicate over bus 28, thereby eliminating the need for one peripheral device to be specially programmed to communicate with another peripheral device. Furthermore, no dedicated wiring is required.

Consider again the example of adding a feature of remote locking and unlocking of the vehicle doors via telephone or email. Here, an operator can send a command to lock the vehicle doors using email or a cell phone and the command is received at the cellular communications module 46 (or its cluster controller 26(2) and passed to the communications module 46). The communications module 46 then transmits a signal destined to the door module 52 over bus 30 to its cluster controller 26(2), which in turn transmits the signal over bus 28 to cluster controller 26(1). The signal is then delivered over bus 30 to the door module 52.

It is noted that although the implementation illustrated in Fig. 3 utilizes the same secondary bus 30 to facilitate information flow within the clusters, separate and distinct buses may be employed within the various clusters. Furthermore, since the clusters are implemented using a single platform (described below in more detail), additional software modules can be easily added to the system to perform the desired function, i.e., locking or unlocking the vehicle via phone or email.

Cluster Controller

Fig. 4 shows an exemplary implementation of a cluster controller. In this illustration, the cluster controller is implemented as a secondary control unit 26, which is embodied as a general-purpose computer with an open platform operating system capable of supporting multiple applications. The master control unit 24 can be configured in a very similar manner.

The cluster controller 26 has a processor 100, volatile memory 102 (e.g., RAM), and non-volatile memory 104 (e.g., ROM, Flash, hard disk, etc.). The cluster controller 26 has a primary bus interface 106 to provide access to the primary vehicle bus 28 and a support bus interface 108 to provide access to the support bus 30.

The cluster controller 26 runs an open platform operating system 110 that supports multiple applications. With an open platform operating system, the cluster controller 26

can support a wide variety of software applications and hardware peripherals on the support bus 30. The operating system is preferably a real-time, multitasking operating system that is capable of supporting "plug-and-play" system configuration and providing high stability, security, and efficiency. One preferred operating system is a "Windows" brand operating system sold by Microsoft Corporation, such as "Windows CE", "Windows NT", or other derivative versions of "Windows". A multitasking operating system allows simultaneous execution of multiple applications.

The cluster controller 26 might also include at least one storage drive—such as a CD ROM drive, PC Card drive, or a floppy disk drive—which permits use of portable storage media. A CD ROM drive enables application-related CDs, as well as musical, video, game, or other types of entertainment CDs. The cluster controller 26 is constructed and sized to mount in the dashboard of the vehicle. A detailed explanation of one suitable construction of a cluster controller is described in U.S. Patent No. 5,794,164, entitled "Vehicle Computer System," which issued August 11, 1998, in the names of Richard D. Beckert, Mark M. Moeller, and William Wong. This application is assigned to Microsoft Corporation and is hereby incorporated by reference.

The SCU 26 maintains an up-to-date copy of executable code 112 run by the MCU 24 to manage data flow among the components. The MCU code 112 is downloaded to the SCU 26 during initialization and stored in the non-volatile memory 104. In the event that the MCU 24 fails, the secondary control unit 26 executes the MCU code 112 to assume the master responsibility of data flow management on the primary bus 28.

Cluster Controller Software Architecture

Fig. 5 shows the software architecture 118 employed in the cluster controller 26. The cluster controller architecture 118 has an application layer supported by an operating system and an underlying hardware layer.

Four applications are shown in the application layer. A CD (compact disk) application 120 operates a CD player and a radio application 122 controls AM/FM radio functionality. A navigation application 124 utilizes the navigation and GPS components 42 and 44, and a phone application 126 operates the communications module 46.

The operating system 110 contains a shell 128, application programming interfaces (APIs) 130-136, a kernel 138, device driver interfaces (DDIs) 140-144, and a hardware abstraction layer (HAL) 146.

The APIs 130-136 define the interfaces to the system platform that are available the application programs 120-126. Each API provides a common and consistent set of interfaces for applications development and provides access for the applications 120-126 to advanced features of the operating system. In this illustration, an audio API 130 provides interfaces for the CD application 120 and radio application 122. Navigation API 132 provides interfaces for the navigation application 124 and a telephony API 134 provides interfaces for the phone application 126. A tuner API 136 provides interfaces for the radio applications 122.

The kernel 138 provides the base operating system functionality. It is responsible for memory management, process management, and certain required file management functions. More specifically, the kernel manages virtual memory, scheduling, multitasking, multithreading, and exception handling.

The device driver interfaces (DDIs) 140-144 expose the services of a peripheral device to the kernel and applications. A well-defined set of DDIs allows different device drivers to look alike to the operating system and application software, removing the need to specifically tailor the operating system or application software to the device it communicates with. Here, a display driver 140 provides interfaces to a display (e.g., monitor, LCD), a disk driver 142 provides interfaces to the memory disk drive peripheral, and a USB (universal serial bus) driver 144 provides interfaces for a USB bus 148.

A hardware abstraction layer (HAL) 146 is a thin layer of code that provides the interface between the kernel and the device hardware. Its goal is to provide software that allows a device driver to support the same device on all hardware platforms. This allows variations in hardware platforms (using different processor) without requiring a separate version of the operating system for each one.

The cluster controller architecture 118 of Fig. 5 is specifically tailored for an in-vehicle multimedia information and communication system. This architecture provides an example of how cluster controller 26(2) might be configured to run cluster 66 (Fig. 3). The cluster controller architecture 118 incorporate the functions of a radio, CD player, navigation, address book, paging, email, cellular phone, as well as a user-friendly display. The in-vehicle entertainment and information system is built on the flexible operating system 110 with common interfaces to enable developers to develop multiple devices and applications, without having to tailor these developments to a specific hardware platform or processor.

Alternatively, cluster controller 26(1) that is governs cluster 64 in Fig. 3 might be configured to run different applications and interface with different hardware components. For example, cluster controller 26(1) might support applications pertaining to wipers, power door locks and seat controls, and the HAL 146 and DDIs provide interfaces for the wiper peripheral device, the door locks module, and the seat module.

Conclusion

The cluster architecture, with an open system OS platform-based controller at its core, allows construction of a vehicle information system that can handle multiple devices, run multiple applications, and permit communications among the devices. The devices can range from simple sensors and actuators or some semi-intelligent devices such as the entry control system, to intelligent devices such as a digital signal processor.

The information flow is managed over common buses, with standard protocols, rather than dedicated wiring and specialized protocols.

Although the invention has been described in language specific to structural features and/or methodological steps, it is to be understood that the invention defined in the appended claims is not necessarily limited to the specific features or steps described. Rather, the specific features and steps are disclosed as preferred forms of implementing the claimed invention.

CLAIMS

1. An automobile information system comprising:

a data communications bus;

multiple components connected to the data communications bus; and

a cluster controller to manage information among the components.

2. An automobile information system as recited in claim 1, wherein the cluster controller comprises a general-purpose computer with an open platform operating system.

3. An automobile information system as recited in claim 1, wherein the cluster controller receives information from an external source and shares the information with the components.

4. An automobile information system as recited in claim 1, wherein the cluster controller facilitates information flow between at least two of the components.

5. An automobile information system as recited in claim 1, wherein the multiple components are selected from a group of components comprising a climate control component, a lighting component, a windshield wipers component, a door lock component, and a power window component.

6. An automobile information system as recited in claim 1, wherein the multiple components are selected from a group of components comprising an audio component, a navigation component, and a communications component.

7. An automobile comprising an automobile information system as recited in claim 1.

8. An automobile information system comprising:

a data communications bus;

multiple components connected to the data communications bus; and

a cluster controller having an open platform, multitasking operating system to support multiple applications and provide interfaces to the multiple components.

9. An automobile comprising an automobile information system as recited in claim 8.

10. An automobile information system comprising:

first and second data communications buses;

a first cluster of components connected to the first data communications bus;

a first cluster controller connected to the first data communications bus to manage information among the first cluster of components;

a second cluster of components connected to the second data communications bus;

a second cluster controller connected to the second data communications bus to manage information among the second cluster of components; and

a third data communications bus to interconnect the first and second cluster controllers.

11. An automobile information system as recited in claim 10, wherein the first and second cluster controllers are each configured as general-purpose computers open platform operating systems.

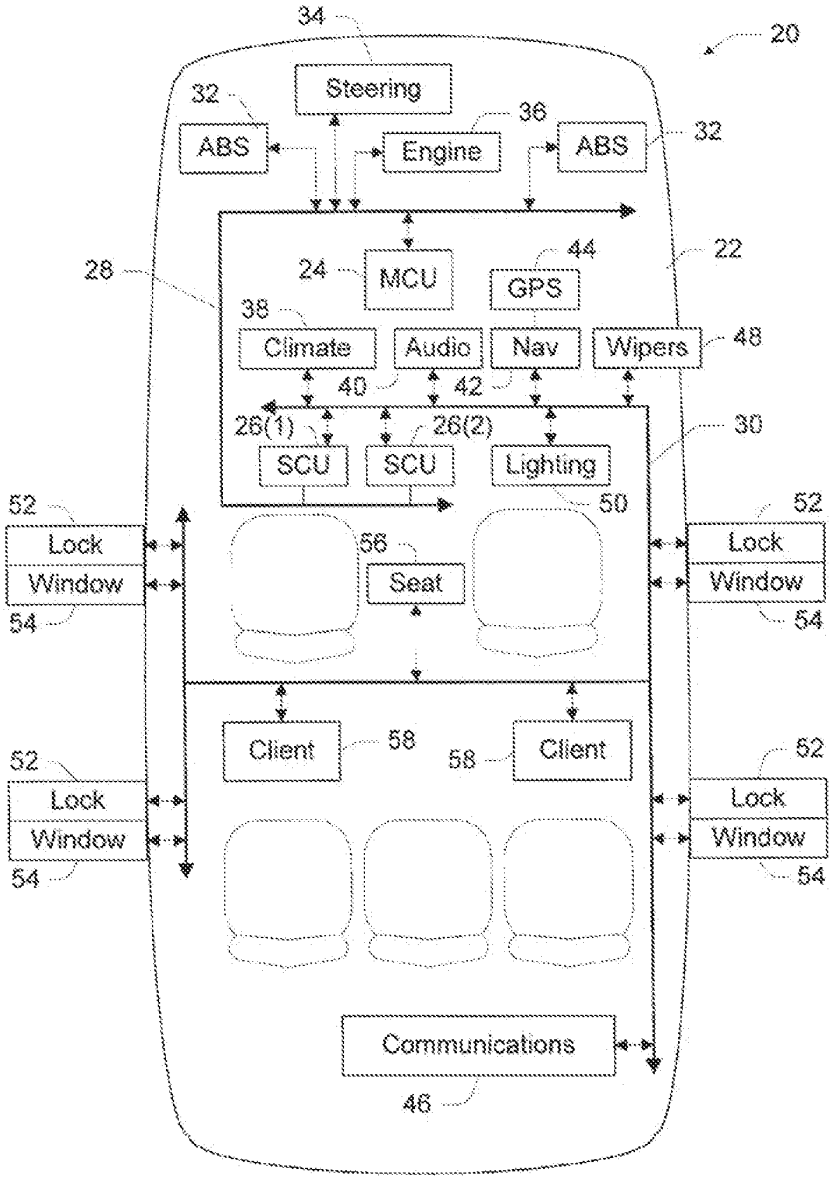
12. An automobile information system as recited in claim 10, wherein the first and second data communications buses are a same bus.

13. An automobile information system as recited in claim 10, wherein communication between a component in the first cluster and a component in the second cluster is facilitated via the first and second cluster controllers.

14. An automobile information system as recited in claim 10, wherein the first cluster of components comprises components selected from a group of components comprising a climate control component, a lighting component, a windshield wipers component, a door lock component, and a power window component.

15. An automobile information system as recited in claim 10, wherein the second cluster of components comprises components selected from a group of components comprising an audio component, a navigation component, and a communications component.

16. An automobile comprising an automobile information system as recited in claim 10.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Steering
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ABS
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Engine
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MCU
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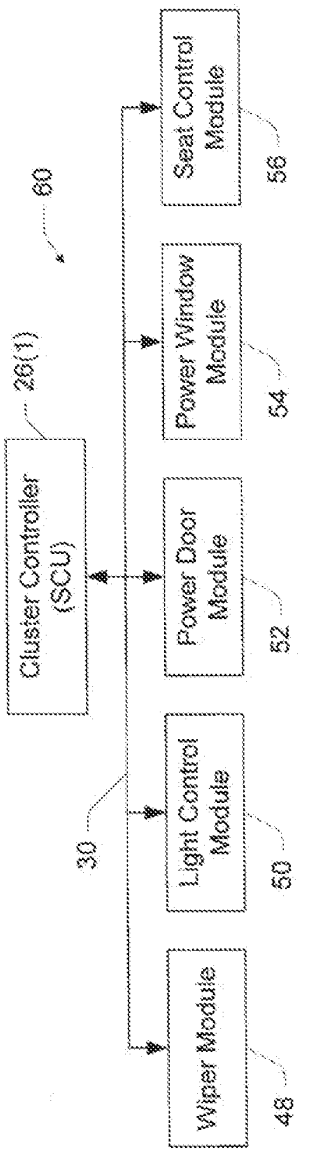
48
40
42
26(1)
26(2)
SCU
SCU
Lighting
30
50
52
Lock
Window
54
56
Seat
52
Lock
Window
54
Client
58
58
Client
52
Lock
Window
54
52
Lock
Window
54
Communications
46

Fig. 1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Cluster Controller (SCU)
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Wiper Module
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Light Control Module
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Power Door Module
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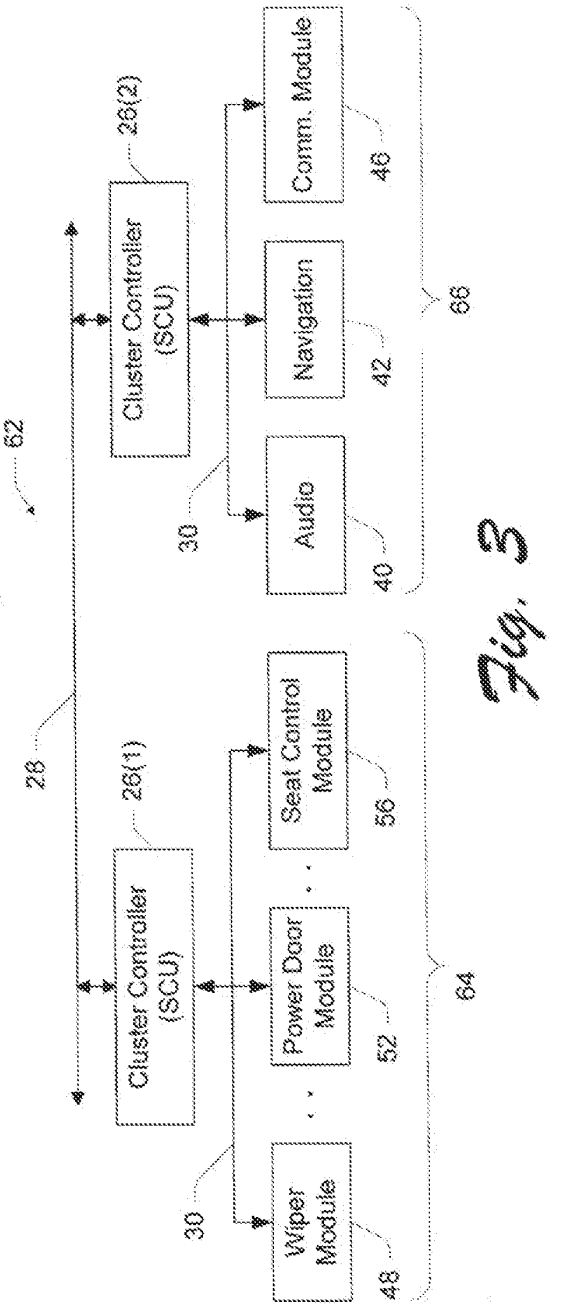
Power Window Module
54
Seat Control Module
56

Fig. 2


62
28
Cluster Controller (SCU)
26(1)
30
Wiper Module
48
Power Door Module
52
Seat Control Module
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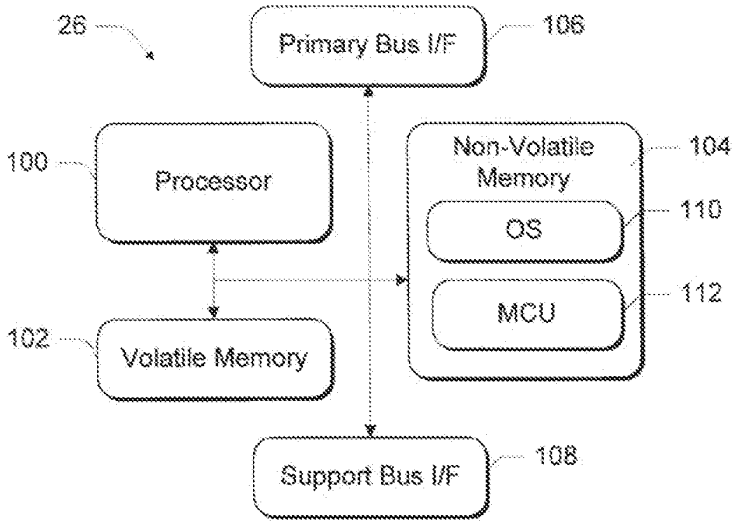
Cluster Controller (SCU)
26(2)
30
Audio
40
Navigation
42
Comm. Module
46
66

Fig. 3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Primary Bus I/F
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Processor
Non-Volatile Memory
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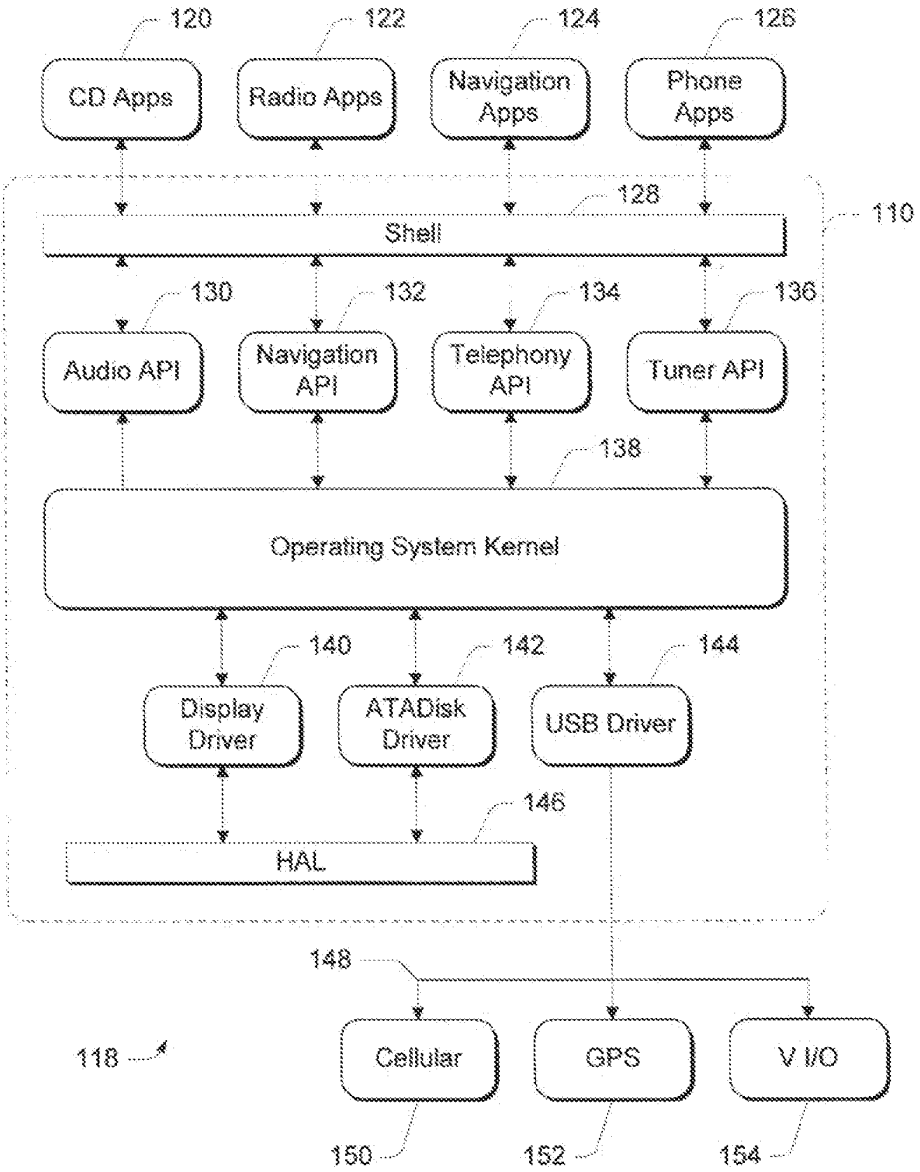
OS
110
MCU
112
102
Volatile Memory
Support Bus I/F
108

Fig. 4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122
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126
CD Apps
Radio Apps
Navigation Apps
Phone Apps
128
110
Shell
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134
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Audio API
Navigation API
Telephony API
Tuner API
138
Operating System Kernel
140
142
144
Display Driver
ATADisk Driver
USB Driver
146
HAL
148
118
Cellular
GPS
V I/O
150
152
154

Fig. 5

INTERNATIONAL SEARCH REPORT

Interr ial Application No
PCT/US 99/16310

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B60R16/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B60R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	HARATA Y ET AL: "A SIMPLIFIED SERIAL COMMUNICATION NETWORK WITHIN A VEHICLE" GATEWAY TO NEW CONCEPTS IN VEHICULAR TECHNOLOGY, SAN FRANCISCO, MAY 1 - 3, 1989, vol. 1, no. CONF. 39, 1 May 1989 (1989-05-01), pages 437-442, XP000076329 INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS	1-9
Y	page 437, column 2, line 15 -page 438, column 1, line 22 page 439, column 2, line 24 - line 41; figures 2-4,9	5,6, 10-16
	-/--	

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 October 1999	20/10/1999

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Geyer, J-L

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INTERNATIONAL SEARCH REPORT

Intern ial Application No
PCT/US 99/16310

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	RAITH T ET AL: "NETZWERKE ZUR INTEGRATION VON SYSTEMFUNKTIONEN DER KRAFTFAHRZEUG-ELEKTRONIK" IT + TI INFORMATIONSTECHNIK UND TECHNISCHE INFORMATIK, vol. 37, no. 6, 1 December 1995 (1995-12-01), pages 28-35, XP000597627 ISSN: 0944-2774 page 29, column 2, line 20 -page 32, column 2, line 8 page 33, column 3, line 1 -page 34, column 3, line 6; figure 2	5,6, 10-16
X	HAJIME SASAKI ET AL: "LSI TECHNOLOGY FOR MEETING THE QUALITY GOALS FOR AUTOMOTIVE ELECTRONICS" VERHICLE ELCTRONICS IN THE 90'S, DEARBORN, OCT. 15 - 17, 1990, 1 October 1990 (1990-10-01), pages 241-248, XP000223547 INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS ISBN: 1-56091-047-X page 246, column 2, line 1 -page 247, column 2, line 23; figures 5-7	1-16
X	SCHMIDT E H ET AL: "REQUIRED ELEMENTS OF INTEGRATED VEHICLE CONTROL SYSTEMS" VERHICLE ELCTRONICS IN THE 90'S, DEARBORN, OCT. 15 - 17, 1990, 1 October 1990 (1990-10-01), pages 463-471, XP000223558 INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS ISBN: 1-56091-047-X the whole document	1-16
Y	WO 98 31118 A (MOTOROLA INC) 16 July 1998 (1998-07-16) page 3, line 9 -page 9, line 18; figures 1-3	1-16
Y	"ELECTRICITE" REVUE TECHNIQUE AUTOMOBILE, vol. 46, no. 528, 1 June 1991 (1991-06-01), pages XLVII-L, LIII - L, XP000231235 ISSN: 0017-307X page L, column 2, line 18 -page LIV, column 1, line 56; figures 1-3,5-12	1-16

-/--

1

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Interr tal Application No
PCT/US 99/16310

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	HEBERLE K: "SO SCHNELL WIE NOETIG, SO LANGSAM WIE MOEGLICH" ELEKTRONIK, vol. 41, no. 19, 15 September 1992 (1992-09-15), pages 78-83, XP000310285 ISSN: 0013-5658 the whole document	1-16

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

...ormation on patent family members

Intern...nal Application No
PCT/US 99/16310

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9831118 A	16-07-1998	EP 0888673 A	07-01-1999

Form PCT/ISA/210 (patent family annex) (July 1992)

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特開平11－317061

(43)公開日　平成11年(1999)11月16日

(51)Int.Cl.*	識別記号	Ｆｉ	
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Ｇ０６Ｆ　3/00	６５１	Ｇ０６Ｆ　3/00	６５１Ａ

審査請求　未請求　請求項の数２　ＯＬ　（全８頁）

(21)出願番号　特願平10－120377

(22)出願日　平成10年(1998)４月30日

(71)出願人　000004329
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神奈川県横浜市神奈川区守屋町３丁目12番地

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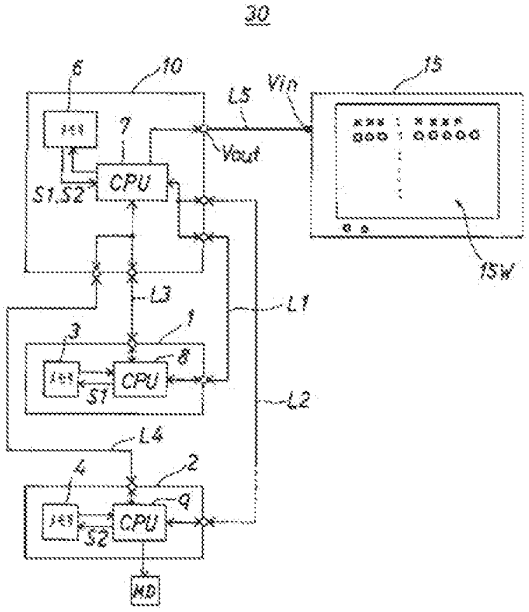
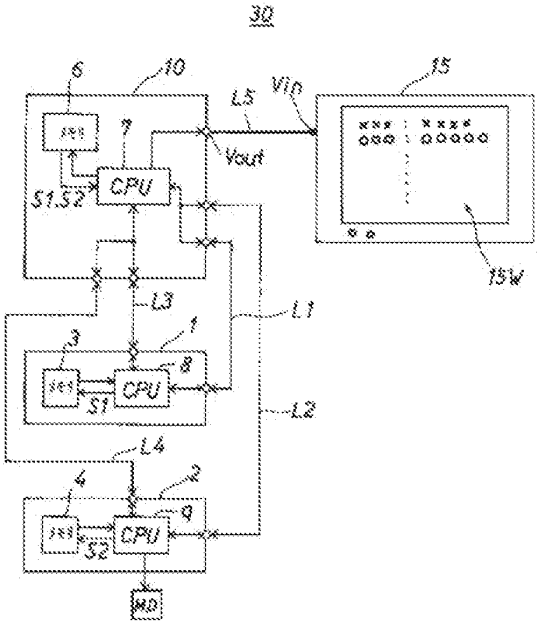
(74)代理人　弁理士　鈴木　旦

最終頁に続く

(54)【発明の名称】　テレビジョン画面を利用したデジタル記録媒体の文字情報制御システム

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I/F
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CPU
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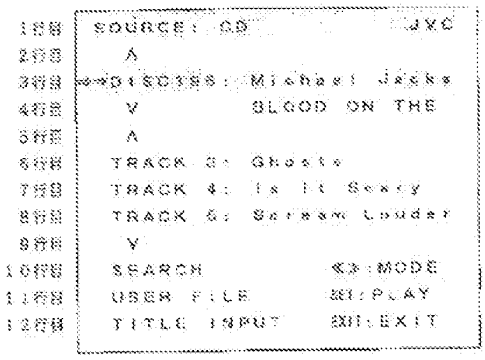
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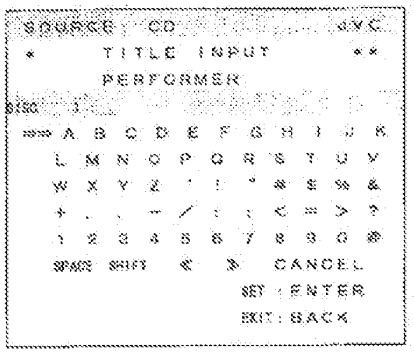
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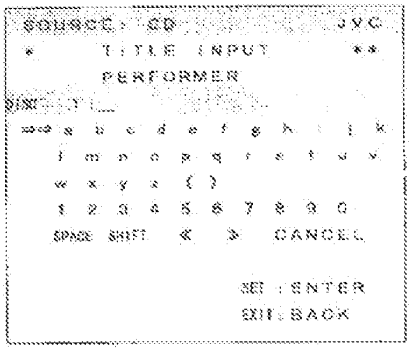
EXIT: BACK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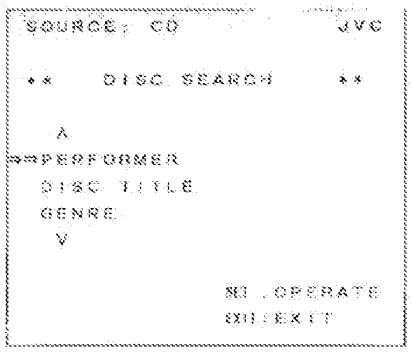
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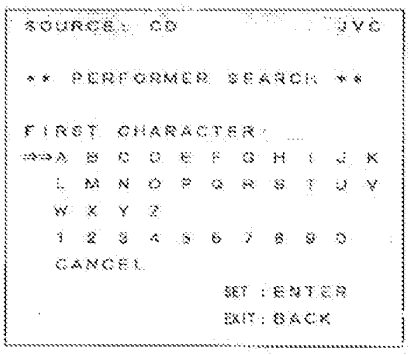
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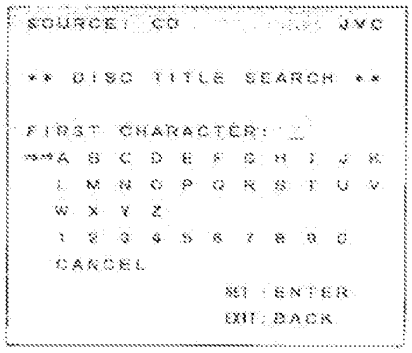
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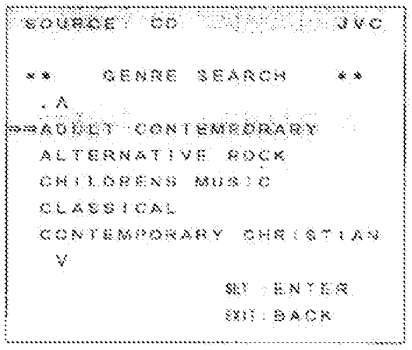
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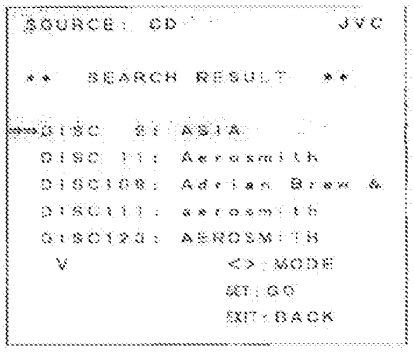
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(19)日本国特許庁（ＪＰ）　(12)特　許　公　報（Ｂ２）　(11)特許番号

第2901445号

(45)発行日　平成11年(1999)６月７日　(24)登録日　平成11年(1999)３月19日

(51)Int.Cl.[6]　識別記号　ＦＩ

Ｇ１１Ｂ　27/34　Ｇ１１Ｂ　27/34　Ｓ

Ｓ

請求項の数１(全　９　頁)

(21)出願番号　特願平4－345213

(22)出願日　平成４年(1992)11月30日

(65)公開番号　特開平6－176551

(43)公開日　平成６年(1994)６月24日

審査請求日　平成８年(1996)10月28日

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(72)発明者　八代　規和
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(74)代理人　弁理士　柴田　昌雄

審査官　小山　和俊

最終頁に続く

(54)【発明の名称】　ミニ・ディスク記録再生装置

(57)【特許請求の範囲】

【請求項１】　ミニ・ディスクのユーザストック情報を記憶するＲＡＭの他にユーザストック操作を行うための作業データ、仮想実行結果データおよび再生レベルを記憶するＲＡＭ、および画像処理装置を設け、ユーザストックの実情報、仮想情報、および再生レベルをグラフックディスプレーに表示し、また、グラフックディスプレーの表示を利用してユーザストック操作をすることを可能としたミニ・ディスク記録再生装置。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】この発明はミニ・ディスク記録再生装置に係わり、特に、ユーザストック情報の表示方式に関する。

【０００２】

【従来の技術】従来、例えば、ＣＤプレーヤやビデオデッキ等の音響、映像機器において、テレビ画面を操作やプレイ状態の表示に用いたものがあった。テレビ画面は複雑な機器構成や動作を分かりやすく表示できるため、非常に有効な表示手段となっていた。

【０００３】一方、ミニ・ディスク記録再生装置では図２０（ａ）に示すように、前面パネルに表示装置１０とキー入力装置の操作キー２が配置されており、操作キー２により装置が操作され、装置の状態やミニ・ディスクのユーザストックの情報が表示装置１０に表示される。

【０００４】すなわち、図２０（ｂ）に示すように、ミニ・ディスク記録再生装置はミニ・ディスク記録再生ユニット０、コントローラ５、キー入力装置２、トックデータ記憶用ＲＡＭ６および表示装置１０により構成されており、キー入力装置２からの指令に従ってコントロー

ラ５がミニ・ディスク記録再生ユニット９を動作させ、ディスクのＴＯＣ、Ｕ－ＴＯＣの読取りやディスクの記録再生が行われる。

【０００５】ディスクから読み取られたＴＯＣ、Ｕ－ＴＯＣのデータはトックデータ記憶用ＲＡＭ８に記憶され、その内容の一部はディスクのアドレス情報等とともに表示装置１０に表示される。

【０００６】表示装置１０は、定形の文字や図形を表示するだけで、複雑なユーザストック情報を一目で分かるように表現することができなかった。

【０００７】

【発明が解決しようとする課題】この発明は上記した点に鑑みてなされたものであって、その目的とするところは、ミニ・ディスクの特徴であるユーザストックエリアに記録された各曲の詳しい情報をグラフックディスプレーの特徴を生かして分りやすく表示することにより操作をしやすくしたミニ・ディスク記録再生装置を提供することにある。

【０００８】

【課題を解決するための手段】この発明のミニ・ディスク記録再生装置は、ミニ・ディスクのユーザストック情報を記憶するＲＡＭの他にユーザストック操作を行うための作業データ、仮想実行結果データおよび再生レベルを記憶するＲＡＭ、および画像処理装置を設け、ユーザストックの実情報、仮想情報、および再生レベルをグラフックディスプレーに表示し、また、グラフックディスプレーの表示を利用してユーザストック操作をすることを可能としたものである。

【０００９】

【作用】書換え可能な光磁気ディスクとして知られているミニ・ディスク（ＭＤ）では内周側のビット情報記録エリア（ＴＯＣ）の外側にレコーダブル・エリアが設けられている。レコーダブル・エリアにはユーザストックエリア（Ｕ－ＴＯＣ）とプログラムエリアがあり、ここにはピットがない代りにトラックを案内するグループ（溝）が掘られており、このグループに沿って情報を記録する。

【００１０】グループは蛇行にうねっており、そのうねり（ウォブル）により生じる信号の平均周波数が２２．０５ｋＨｚとなるようにディスクの回転が制御される。さらに、このウォブルの中に記録開始位置からの絶対時間（アドレス情報）がＦＭ変調されて記録されている。

【００１１】記録は磁性膜の磁化により行われる。すなわち、磁性膜をレーザスポットによりキュリー点以上に加熱し、そこに信号に従って反転する磁界を加えた後、冷却すると磁性膜に信号が磁化方向の変化として記録される。このような記録は既に記録されている部分にも行うことができる。すなわち重ね書き（オーバライト）が可能である。

【００１２】記録位置の管理はＵ－ＴＯＣに記録された情報により行われる。プログラムエリアの記録には各曲毎にトラックナンバー（ＴＮＯ）が１から始まる連続自然数として付され各ＴＮＯ毎に開始時間、終了時間、タイトル等の情報が記録されている。ＴＮＯとその付属情報がＵ－ＴＯＣから消去されるとその部分は未記録部分として扱われる。

【００１３】ディスクが装置にローディングされるとＵ－ＴＯＣ情報が読み出され、そのデータが装置のＲＡＭに記憶され、それ以降はＲＡＭに記憶されているＵ－ＴＯＣ情報により記録再生の管理が行われる。各曲の記録や消去が行われるとＲＡＭの記憶内容が書換えられ、その記憶情報はディスクを装置から取り出す前にディスクのＵ－ＴＯＣに記録される。

【００１４】このように、ディスクの管理情報はユーザストック情報として装置のＲＡＭに記憶され、その記憶データを変更することにより、ディスクのＴＮＯの変更や消去が可能であるが、この発明のミニ・ディスク記録再生装置によれば、ユーザストック内容変更操作の仮想実行結果データはＲＡＭに記憶され、画像処理装置によりグラフック表示のビデオ信号とされてグラフックディスプレーに表示されるので操作ミスが防止される。

【００１５】また、通常プレイ、プログラムプレー、録音動作の途中やポーズ中にもユーザストック情報を種々の形態で表示できるので、動作途中の状態を一目で確認することができる。

【００１６】

【実施例】この発明の実施例であるミニ・ディスク記録再生装置を図面に基づいて説明する。図１（ａ）はこの発明の実施例であるミニ・ディスク記録再生装置の構成を示す斜視図、図１（ｂ）は同ミニ・ディスク記録再生装置の構成を示すブロック図である。

【００１７】このミニ・ディスク記録再生装置は図１（ａ）に示すように、ミニ・ディスク記録再生装置本体１にキー入力装置２、マウス３およびグラフックディスプレイ４を接続して構成されている。グラフックディスプレイ４はこの実施例ではＣＲＴが用いられているがテレビの画像表示部を用いることもできる。

【００１８】さらに、図１（ｂ）に詳しく示されるように、ミニ・ディスク記録再生装置本体はミニ・ディスク記録再生ユニット９、コントローラ５、トックデータ記憶用ＲＡＭ６、作業データ記憶用ＲＡＭ７および画像処理装置などにより構成されており、キー入力装置２からの指令に従ってコントローラ５がミニ・ディスク記録再生ユニット９を動作させ、ディスクのＴＯＣ、Ｕ－ＴＯＣの読取りやディスクの記録再生が行われる。

【００１９】ディスクから読み取られたＴＯＣ、Ｕ－ＴＯＣのデータとしてはディスクタイプ（プリマスタード、レコーダブル、ハイブリッドの区別）、記録レーザパワー、使用セクタインジケータ、リードアウトスタートアドレス、トラック（スタートアドレス、エンドア

ドレス）トラックモード（モノ、ステレオ、エンファシス、コピー可または不可区別）、ディスクネーム、トラックネーム、録音日時分秒、リンクポインタ（アドレス接続情報）があり、これらのデータはトックデータ記憶用ＲＡＭ６に記憶される。

【００２０】トックデータ記憶用ＲＡＭ６に記憶された内容はキー入力装置２またはマウス３を操作することにより作業データ記憶用ＲＡＭ７を用いながら変更することができる。トックデータ記憶用ＲＡＭ６の記憶データや作業データ記憶用ＲＡＭ７に記憶された変更途中のデータは画像処理装置８により映像信号に変換されグラックディスプレイ４に表示される。

【００２１】グラックディスプレイ４への表示項目や表示態様はキー入力装置２で指定される。以下その表示例を図２乃至図１７を参照して説明する。図２に示す画面は再生および再生ポーズ時の表示例であり、トック情報を整理して表示している。

【００２２】上部Ａ欄は画面の表示内容のタイトルを示している。中央部はデータテーブル部であり、Ｂ欄には個人が入力したアルバムタイトルが表示され、Ｃ欄には設定更新録音月日が表示される。その下に各ＴＮＯ毎の曲名、曲時間、演し時間、録音日時が表にして示されている。矢印Ｅで示すＴＮＯ４は再生またはポーズ中のトラックであり変色または点滅して表示される。下部のＤ欄には再生またはポーズ中のトラックと時間が示されている。

【００２３】図３に示す画面は再生および再生ポーズ時の他の態様の表示例であり、各ＴＮＯのデータ位置を図式で表示している。アドレスに対応してＴＮＯのデータが帯状に表現され帯の長さはデータ量（時間）に比例する。ＴＮＯの順に縦にシフトして示されており、データ位置とＴＮＯとの対応が把握できる。なおデータは図示の位置において、左から右方向に再生される。なお帯の左側の欄にアドレス（スタート値、エンド値、長さ）が数字で示されている。再生またはポーズ場所のＴＮＯは図２の場合と同様に矢印Ｅで示されているが、さらに、データ帯表示部に縦線Ｆで示されている。

【００２４】図４は図３と同様の表現を示しているが、この場合はＴＮＯ６のデータが飛び飛びに記録され、その帯状表示が島状となっている。ＴＮＯ８は３分割され、各分割はリンクポインタにより接続されているが、その再生順序は示されていない。このＴＮＯ６のデータ再生順序を分かるようにしたのが図５に示す表示態様である。図５ではＴＮＯ６の分割番号順にデータ位置（島）が下方向にシフトして示されており、再生は上の島から下の島の順に行われることが分かる。なお、図５ではアドレス（スタート値、エンド値、長さ）はトラックを分割したらの示されている。

【００２５】図６に示す画面は再生曲順をプログラム設定しているときの表示例である。プログラム編集されるソースのデータが右側に示され、また、プログラム中およびプログラム終了後のデータが左側に示され、このように双方の内容を見ながらプログラム作製が可能となる。

【００２６】図７はプログラム再生時の画面を示す。データテーブルはプログラム順（再生順）に表示され、本来のＴＮＯも併せて表示されている。現在再生位置の表示は再生、ポーズ時の場合と同様に示されている。

【００２７】図８は録音、録音ポーズおよびソースモニター時の画面を示す。入力ソース（デジタル、アナログの区別）、レコードレベル位置、レベルメータおよびレコードマージンの表示に加え、アッテネータ機能、ＴＮＯ自動変更、手動変更の区別等の録音付加機能の状態も併せて表示される。

【００２８】また、現在録音位置がＥで示す縦線で表示され、録音済領域と残領域とが色別または点滅により区別されて表現される。このように録音残量を視覚により表現することが可能である。

【００２９】図９に示す画面は録音時の各ＴＮＯのデータ位置を図式で表示している。表示の方法は図３に示した方法と同じである。録音中トラックのアドレス／タイムのエンド位置表示（図示のＧ）は実動作に合せてカウントされデータの帯（図示のＨ）は伸びていく。また、録音中のデータの帯は点滅している。ディスクの録音履歴により前詰でない録音データは島状に存在することは図４で示した通りであるが、そのような録音データの形成過程を見ることができる。

【００３０】図１０はＴＮＯを振り直す場合の画面を表示している。この画面を用いてデータ内容を確認しながら新しいＴＮＯが設定できる。新しいＴＮＯの設定は既存のＴＮＯに対応して数を入力して行われる。入力はカーソル移動とテンキーで行われる。

【００３１】ＴＮＯの設定途中に図１１に示す実行想定画面に切換えることにより設定後の状態を把握しながら作業が進められ、実行コマンドを入力することにより作業データ記憶用ＲＡＭのデータがトックデータ記憶用ＲＡＭに書き移されて新しいＴＮＯの設定が終了する。

【００３２】図１２はＴＮＯを消去する場合の画面を表示している。消去するＴＮＯを指示すると、トラックのデータ位置に対応した帯状表示が変色または点滅されて消去されることを示す。複数の消去トラックの設定が可能でＡＬＬを指示すると全トラックが消去される。

【００３３】図１２の画面上で消去トラックを設定し、実行コマンドを入力することによりＵ－ＴＯＣデータの書換えが行われ、書換えられた状態が図１３に示されている。図１３の画面上で消去トラックの設定を続けることができる。

【００３４】図１４はＴＮＯの消去と振り直し作業を同時に行う場合の画面を表示している。設定および実行方法は前述のＴＮＯの消去または振り直しの場合と同様で

ある。図１５に示す実行想定画面に切換えることにより設定後の状態を把握しながら作業が進められる。

【００３５】図１６はＴＮＯのスタートアドレスまたはエンドアドレスを移動させる場合の画面を示す。ディスク中の位置を指定して再生しながらキー指定すると、指定位置近傍のＴＮＯスタートアドレス／エンドアドレス位置を中心に再生データを取込み、時間－レベルチャートが現状のスタートアドレス位置、エンドアドレス位置を含めて表示される。

【００３６】スタートアドレス位置およびエンドアドレス位置のシフト作業はキー操作により画面上のアドレス位置指標（図においてＪおよびＫで示す）をキー操作で移動させて行われる。移動後のアドレス値は画面上の移動量をアドレス値に換算して算出され作業用データ記憶用ＲＡＭに書込まれる。

【００３７】ユーザはレベルエンベロープを見ながら作業できる。また、リハーサル機能により作業用データ記憶用ＲＡＭのデータにより再生して曲頭タイミングを確認してから、スタートアドレス位置およびエンドアドレス位置をシフトすることができる。

【００３８】図１７はＴＮＯを追加設定する場合の画面を示す。ディスク中の位置を指定して再生しながらキー指定すると、指定位置を中心に再生データを取込み、時間－レベルチャートが表示される。

【００３９】スタートアドレス位置のシフト作業はキー操作により画面上のスタートアドレス位置指標（図においてＫで示す）をキー操作で移動させて行われる。移動後のアドレス値は画面上の移動量をアドレス値に換算して算出されて作業用データ記憶用ＲＡＭに書込まれる。

【００４０】ユーザはレベルエンベロープを見ながら作業できる。また、リハーサル機能により作業用データ記憶用ＲＡＭのデータにより再生して曲頭タイミングを確認し、追加ＴＮＯスタートアドレス位置を設定することができる。

【００４１】図１８はこの発明の他の実施例を示す。この場合はミニ・ディスク記録再生装置に小形ディスプレイが組込まれており、各種作業と表示が単機で行える。

【００４２】図１９はこの発明のさらに他の実施例を示す。この場合はコマンダーおよびリモコンに表示部が組込まれており、リモコンまたはコマンダーで各種作業および表示が可能となっている。

【００４３】図２０はこの発明のさらに他の実施例を示す。この場合はミニ・ディスク記録再生装置に設けられたデータインターフェースにパソコンの入出力端子を接続して、パソコンに作動ソフト（フロッピーディスク記憶データ）を入力することにより、パソコンのキーボードとディスプレイを用いて作業を行うことができる。

【００４４】図２１はこの発明のさらに他の実施例を示す。この場合は図２０に示すものと同様のミニ・ディスク記録再生装置のデータインターフェースに家庭用ゲーム機の入出力端子を接続して、家庭用ゲーム機に作動ソフト（ロムカセット記憶データ）を入力することにより、家庭用ゲーム機のキーとテレビ画面を用いて作業を行うことができる。

【００４５】図２２はこの発明のさらに他の実施例を示す。この場合は各種入力機能と表示機能がＡＶアンプに組込まれミニ・ディスク記録再生装置以外の表示対応オーディオ機器も総合的に管理して表示、操作可能としてある。

【００４６】図２３はこの発明のさらに他の実施例を示す。この場合はミニ・ディスク記録再生装置にＭＤチェンジャーが組込まれており、複数のディスクの情報を管理し一括表示等が可能となっている。複数ディスクにわたるプログラム編集も画面上で可能である。

【００４７】図２４はこの発明のさらに他の実施例を示す。この場合は画面上のキーボード表示により文字入力が行われ、キーボードを持たないシステム構成において、マウス、本体キー等により文字入力が可能となる。

【００４８】図２５はこの発明のさらに他の実施例を示す。この場合はＭＤ表示システムにプリント機能が付加されている。図２５（ａ）はキー入力装置とディスプレーのシステムに印刷機が接続される場合を示し、図２５（ｂ）に示すものはＭＤ記録再生装置にワードプロセッサーが接続され、ワードプロセッサーにソフトを入力することによりワードプロセッサーのキーボード、ディスプレイおよびプリンターが用いられる。このようにして画面で編集構成した内容をプリントアウトすることによりプログラムリスト、カセットインデックス等を作製することが可能となる。

【００４９】

【発明の効果】この発明のミニ・ディスク記録再生装置によれば、グラフック表示画面を用いることによりディスクから得られる多様な情報を分りやすく表現することができる。

【００５０】また、時間、データ長、トラック位置、録音レベル等の数字情報を視覚的に表現できるため、データの操作状態やシステムの動作状態が容易に把握でき、ＭＤシステムの持つ機能を有効に活用できるようになる。

【図面の簡単な説明】

【図１】図１（ａ）はこの発明の実施例であるミニ・ディスク記録再生装置の構成を示す斜視図、図１（ｂ）は同ミニ・ディスク記録再生装置の構成を示すブロック図である。

【図２】同ミニ・ディスク記録再生装置の画面表示の例を示す図である。

【図３】同ミニ・ディスク記録再生装置の画面表示の他の例を示す図である。

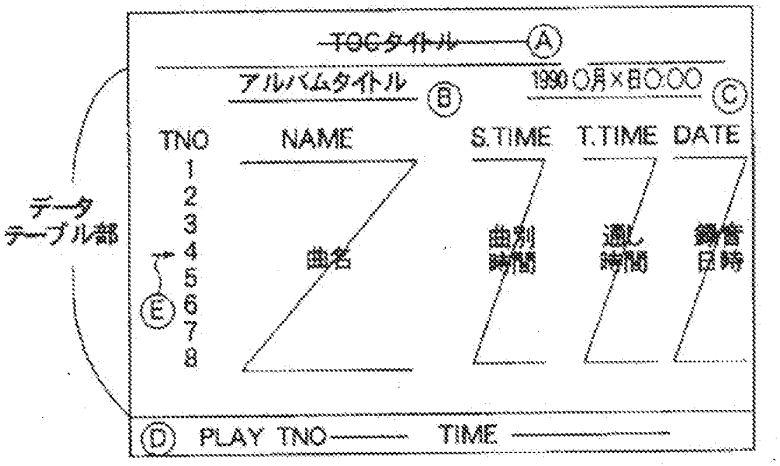
【図４】同ミニ・ディスク記録再生装置の画面表示のさらに他の例を示す図である。

【図５】同ミニ・ディスク記録再生装置の画面表示のさらに他の例を示す図である。
【図６】同ミニ・ディスク記録再生装置の画面表示のさらに他の例を示す図である。
【図７】同ミニ・ディスク記録再生装置の画面表示のさらに他の例を示す図である。
【図８】同ミニ・ディスク記録再生装置の画面表示のさらに他の例を示す図である。
【図９】同ミニ・ディスク記録再生装置の画面表示のさらに他の例を示す図である。
【図１０】同ミニ・ディスク記録再生装置の画面表示のさらに他の例を示す図である。
【図１１】同ミニ・ディスク記録再生装置の画面表示のさらに他の例を示す図である。
【図１２】同ミニ・ディスク記録再生装置の画面表示のさらに他の例を示す図である。
【図１３】同ミニ・ディスク記録再生装置の画面表示のさらに他の例を示す図である。
【図１４】同ミニ・ディスク記録再生装置の画面表示のさらに他の例を示す図である。
【図１５】同ミニ・ディスク記録再生装置の画面表示のさらに他の例を示す図である。
【図１６】同ミニ・ディスク記録再生装置の画面表示のさらに他の例を示す図である。
【図１７】同ミニ・ディスク記録再生装置の画面表示のさらに他の例を示す図である。
【図１８】この発明の他の実施例であるミニ・ディスク記録再生装置を示す斜視図である。
【図１９】この発明のさらに他の実施例であるミニ・ディスク記録再生装置の構成を示す図である。

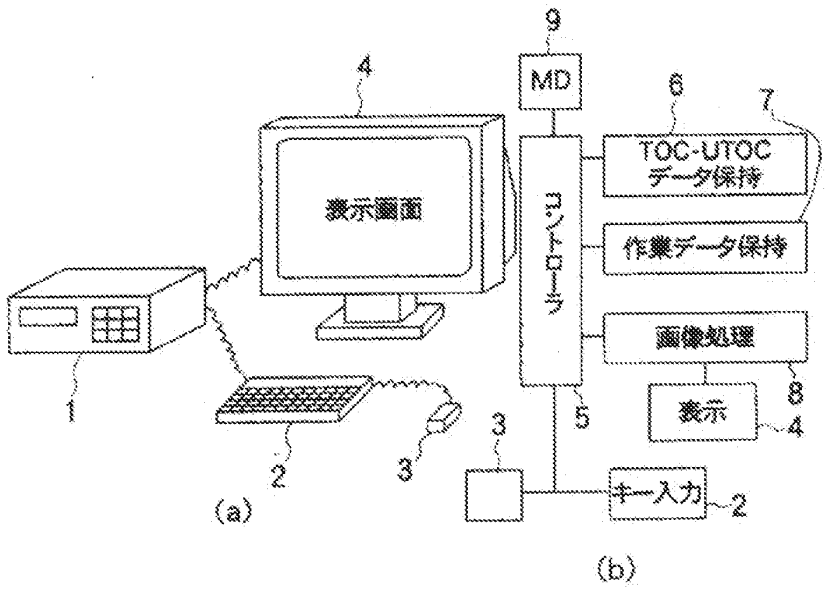
＊【図２０】この発明のさらに他の実施例であるミニ・ディスク記録再生装置の構成を示す図である。
【図２１】この発明のさらに他の実施例であるミニ・ディスク記録再生装置の構成を示す図である。
【図２２】この発明のさらに他の実施例であるミニ・ディスク記録再生装置の構成を示す図である。
【図２３】図２３（ａ）はこの発明のさらに他の実施例であるミニ・ディスク記録再生装置の構成を示す斜視図、図２３（ｂ）は同ミニ・ディスク記録再生装置の画面表示の例を示す図である。
【図２４】この発明のさらに他の実施例であるミニ・ディスク記録再生装置の画面表示の例を示す図である。
【図２５】図２５（ａ）はこの発明のさらに他の実施例であるミニ・ディスク記録再生装置の構成を示す図、図２５（ｂ）は同実施例の変形例の構成を示す図である。
【図２６】図２５（ａ）は従来のミニ・ディスク記録再生装置の例を示す斜視図、図２６（ｂ）は同ミニ・ディスク記録再生装置の構成を示すブロック図である。

【符号の説明】
１　ミニ・ディスク記録再生装置本体
２　キー入力装置
３　マウス
４　グラフックディスプレイ
５　コントローラ
６　トックデータ記憶用ＲＡＭ
７　作業用データ記憶用ＲＡＭ
８　画像処理装置
９　ミニ・ディスク記録再生ユニット
１０　表示装置

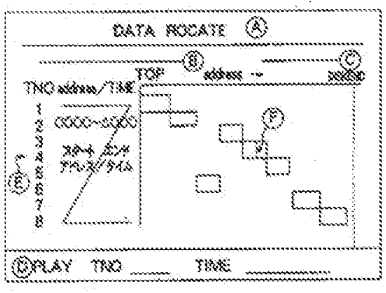
【図２】



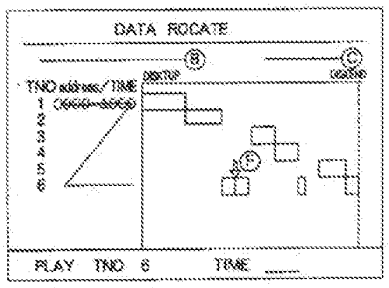
【図1】


9
MD
4
6
7
TOC-UTOC
データ保持
表示画面
コントローラ
作業データ保持
画像処理
8
表示
4
1
2
3
3
5
キー入力
2
(a)
(b)

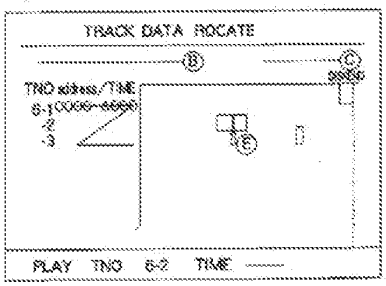
【図3】


DATA ROCATE Ⓐ
TOP
address →
TNO address/TIME
1
2
3
4
5
6
7
8
Ⓒ
Ⓑ
Ⓓ
Ⓔ
PLAY TNO ___ TIME ___

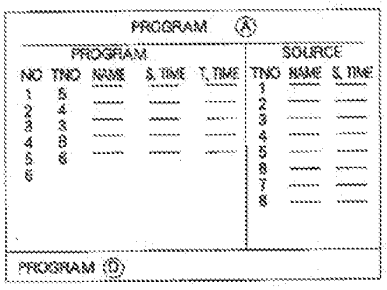
【図4】


DATA ROCATE
TNO address/TIME
1
2
3
4
5
6
Ⓑ
Ⓒ
Ⓔ
PLAY TNO 6 TIME ___

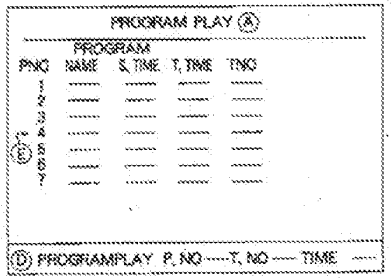
【図5】


TRACK DATA ROCATE
TNO address/TIME
6-1
2
3
Ⓑ
Ⓒ
Ⓔ
PLAY TNO 6-2 TIME ___

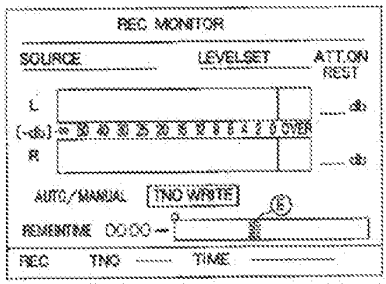
【図6】


PROGRAM Ⓐ
PROGRAM
SOURCE
NO TNO NAME S_TIME T_TIME
TNO NAME S_TIME
1 5
2 4
3 3
4 8
5 6
6
1
2
3
4
5
6
7
8
PROGRAM Ⓓ

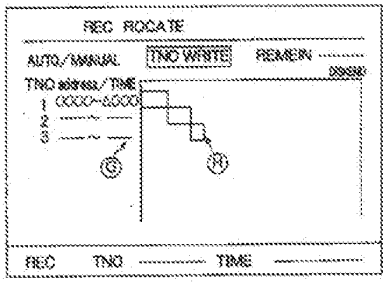
【図７】



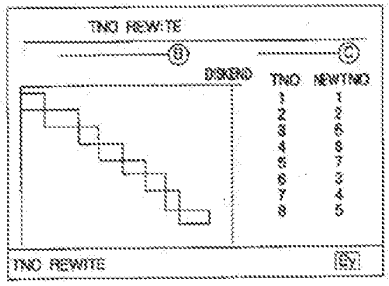
【図８】



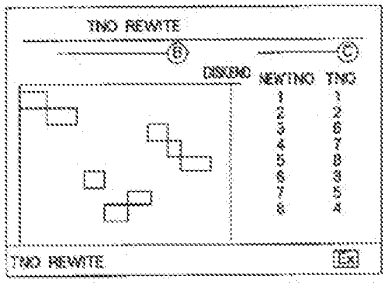
【図９】



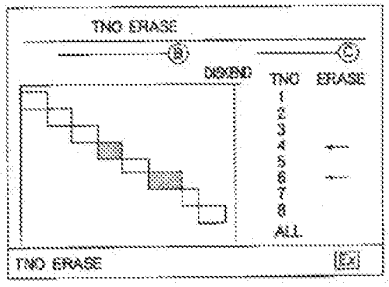
【図１０】



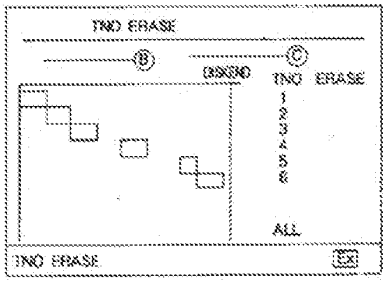
【図１１】



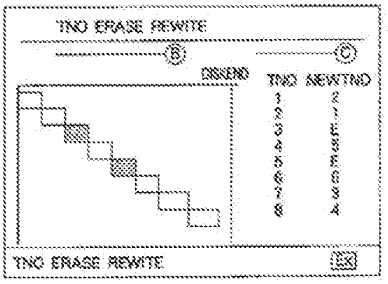
【図１２】



【図１３】



【図１４】



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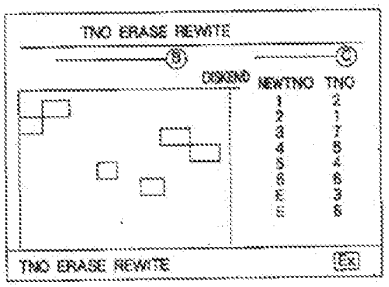
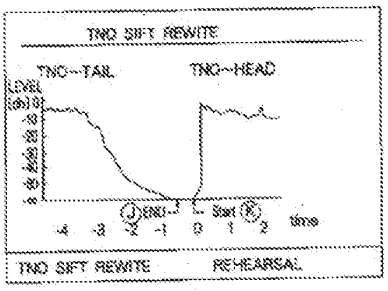


【図16】



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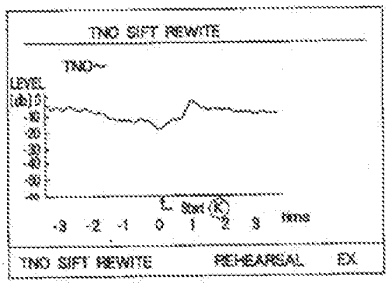
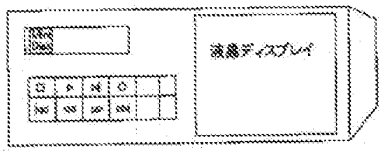
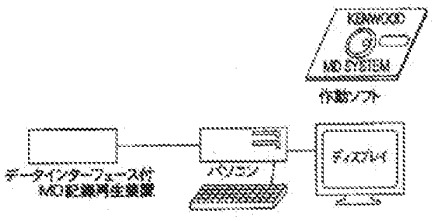


【図18】



【図19】

【図20】



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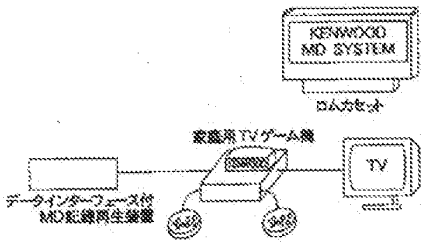

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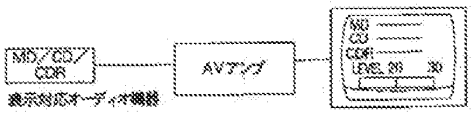
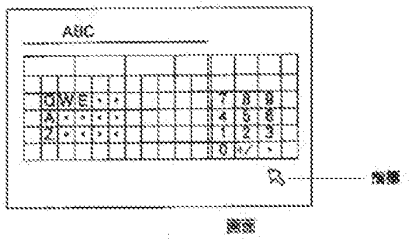
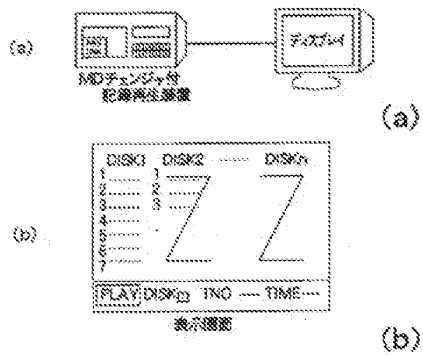


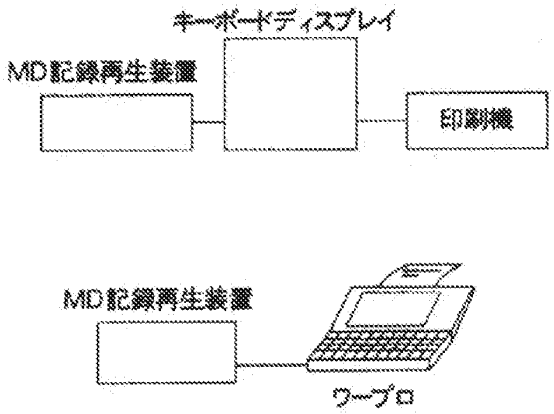
【図24】



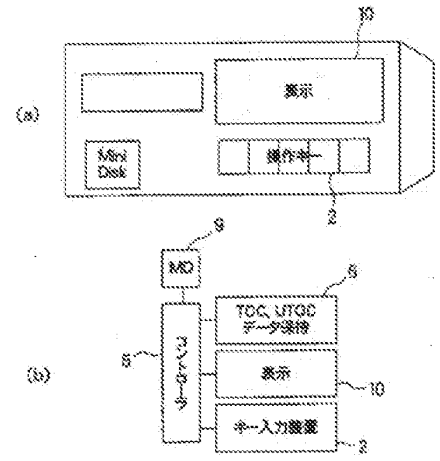
【図２３】



【図２５】



【図２６】



フロントページの続き

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(58)調査した分野(Int.Cl.⁷, ＤＢ名)
G11B 27/00 - 27/34

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Application Number:	12015320
International Application Number:	
Confirmation Number:	2156
Title of Invention:	Method for Managing Media
First Named Inventor/Applicant Name:	Russell W. White
Customer Number:	21906
Filer:	Edwin E. Richards/STephanie Petreas
Filer Authorized By:	Edwin E. Richards
Attorney Docket Number:	AFF.0004C5US
Receipt Date:	08-JUN-2009
Filing Date:	16-JAN-2008
Time Stamp:	11:36:36
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Filed (SB/08)	AFF004C5IDS1449Form2.pdf	405157 6750040845808ef4436c969b8111e0fc3e3f422c	no	12

Warnings:	
Information:	

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2	Information Disclosure Statement (IDS) Filed (SB/08)	AFF004C5IDS1449Form3.pdf	229983 f6c02e80ac71e5ffc3525c4e2f685b04f3af88e6	no	6
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3	NPL Documents	DEF00005515.pdf	258598 b3af0f16c2c7b269fb38be94e08791ad978b93d4	no	2
Warnings:					
Information:					
4	NPL Documents	DEF00005517.pdf	328909 1dc843d0fb3a8e1de743be3673da6916bcfd9fdc	no	2
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5	Foreign Reference	DEF00005519.pdf	3457427 3ca47194af30f2376d20af529d489ec14e6aa743	no	26
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6	Foreign Reference	DEF00005545.pdf	272834 e6f5a4c06ad71d7429331aeb94968efa5b515c09	no	3
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7	Foreign Reference	DEF00005548.pdf	1572033 559b960f578809d9377338d110da1149dff6e16d	no	9
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8	NPL Documents	DEF00005557.pdf	14912002 1c39f4922f42816736efff3e92b06e9c31f44d58	no	151
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9	NPL Documents	DEF00005708.pdf	7424466 34f9bb60ba208a9283712bb6fb7713bda93b8e69	no	83
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10	NPL Documents	DEF00005791.pdf	6444456 dd3d60ed91e495e714549596bceaba40861ed725	no	39
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12	NPL Documents	DEF00005871.pdf	4108742 8a85f6c5a5ca67e6981a65b3eedc2d96c67c953b	no	35
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13	NPL Documents	DEF00005906.pdf	59826 a9ca73c4b6705f7bf73cac6107bb738b4d054dee	no	1
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17	NPL Documents	DEF00005957.pdf	453100 f9007f9687c9fdca2b8ce3d8543ec2327d0cdfd6	no	4
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18	NPL Documents	DEF00005961.pdf	4649387 ddf5648c014335cc5f4de6e9bf2b53005195abad	no	17
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19	NPL Documents	DEF00005978.pdf	923214 f56cb5acd88dd348bc44a58200a824e76c9096b0	no	4
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20	NPL Documents	DEF00005982.pdf	798012 392fa385ba5c2f6f20da98b87a266c8b78e11de7	no	4
Warnings:					
Information:					
			Total Files Size (in bytes):	59228626	

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (04-09)
Approved for use through 05/31/2009. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	12015320
Filing Date	2008-01-16
First Named Inventor	Russell W. White, et al.
Art Unit	2617
Examiner Name	Erika A. Gary
Attorney Docket Number	AFF.004C5US

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

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U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

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FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2]	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	2000-66974	JP		2000-03-03			☐
	2	11-68685	JP		1999-03-09			☐
	3	CN 1218258A	CN		1999-06-02			☐

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	12015320
	Filing Date	2008-01-16
	First Named Inventor	Russell W. White, et al.
	Art Unit	2617
	Examiner Name	Erika A. Gary
	Attorney Docket Number	AFF.004C5US

	4	H11-242686	JP		1999-09-07	Sony Corporation		☐
	5	DE 44 31 070 B4	DE		2004-07-22	DaimlerChrysler AG		☐
	6	0 569 343 A1	EP		1993-10-11	Pioneer Electronic Corporation		☐
	7	0 675 341 A1	EP		1995-04-10	Honda Giken Kogyo		☐
	8	0 771 686 A2	EP		1997-07-05	Toyota Jidosha Kabushiki Kaisha Toyota-shi, Aichi-		☐
	9	H4-261576	JP		1992-09-17	Mitsubishi Electric Corporation		☐
	10	2-301330	JP		1990-12-13			☐
	11	5-294250	JP		1993-11-09			☐
	12	6-187597	JP		1994-07-08			☐
	13	JP6289118	JP		1994-10-18	Sega Enterprises KK		☐
	14	JP6294659	JP		1994-10-21	Dainippon Printing Co. LTD.		☐

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	12015320
	Filing Date	2008-01-16
	First Named Inventor	Russell W. White, et al.
	Art Unit	2617
	Examiner Name	Erika A. Gary
	Attorney Docket Number	AFF.004C5US

	15	07-129895	JP		1995-05-19	Honda Motor Co Ltd		☐
	16	07-146155	JP		1995-06-06	Honda Motor Co Ltd		☐
	17	7-262493	JP		1995-10-13	CSK Corporation		☐
	18	7-262493	JP		1995-10-13			☐
	19	JP7270171	JP		1995-10-20	Sumitomo Electronic Industries		☐
	20	JP7036382	JP		1995-02-07	Mitsubishi Electric Corp.		☐
	21	8-110231	JP		1996-04-30			☐
	22	9-61514	JP		1997-03-07			☐
	23	10-103966	JP		1998-04-24			☐
	24	10-143349	JP		1998-05-29	Compaq Computer Corporation		☐
	25	JP1018712	JP		1989-01-23	Mazda Motor		☐

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	12015320
	Filing Date	2008-01-16
	First Named Inventor	Russell W. White, et al.
	Art Unit	2617
	Examiner Name	Erika A. Gary
	Attorney Docket Number	AFF.004C5US

	26	JP5077679	JP		1993-03-30	Nissan Motor		☐
	27	JP59085599	JP		1984-05-17	Nissan Motor		☐
	28	JP63136828	JP		1988-06-09	Pioneer Electronic Corp.		☐
	29	63-136828	JP		1988-06-09			☐
	30	WO 96/04724	WO		1996-02-15	Emerson, Harry		☐
	31	WO 96/07110	WO		1996-03-07	British Telecommunications Public Limited Company		☐
	32	WO 97/13657	WO		1997-04-17	United Technologies Automotive, Inc.		☐
	33	H11-317061	JP		1999-11-16	Victor Company of Japan, LTD.		☒
	34	2901445	JP		1999-03-19	Kenwood Corporation		☒
	35	WO 99/35009	WO		1999-07-15	Microsoft Corporation		☐
	36	11-219580	JP		1999-08-10			☐

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