US 20030115603A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2003/0115603 A1**

Lemmons et al. (43) **Pub. Date: Jun. 19, 2003**

(54) **INTERACTIVE PROGRAM GUIDE SYSTEMS AND PROCESSES**

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(21) Appl. No.: **10/115,762**

(22) Filed: **Apr. 2, 2002**

Related U.S. Application Data

(63) Continuation of application No. 09/770,865, filed on Jan. 26, 2001, which is a continuation of application No. 09/189,332, filed on Nov. 9, 1998, now Pat. No. 6,266,814, which is a continuation of application No. 08/419,077, filed on Apr. 6, 1995, now Pat. No. 5,880,768.

Publication Classification

(51) **Int. Cl.**[7] **G06F 3/00**; H04N 5/445; G06F 13/00

(52) **U.S. Cl.** **725/53**; 725/39; 725/44

(57) **ABSTRACT**

Interactive program guide systems and related processes are provided which can automatically tune a television, or program a VCR, based on program selections made from program schedule information displayed on a television or other suitable video monitor. The interactive program guide is preferably implemented using a microprocessor-controlled set-top box that is coupled to the viewer's television set. The set-top box receives program schedule information and software from a headend telecasting center. Preferably, program schedule information for the current day and at least six subsequent days is stored in a memory within the set-top box. The interactive program guide provides a display mode for allowing the viewer to apply a restrictive search selection criterion and a nonrestrictive sort attribute to the program schedule information.

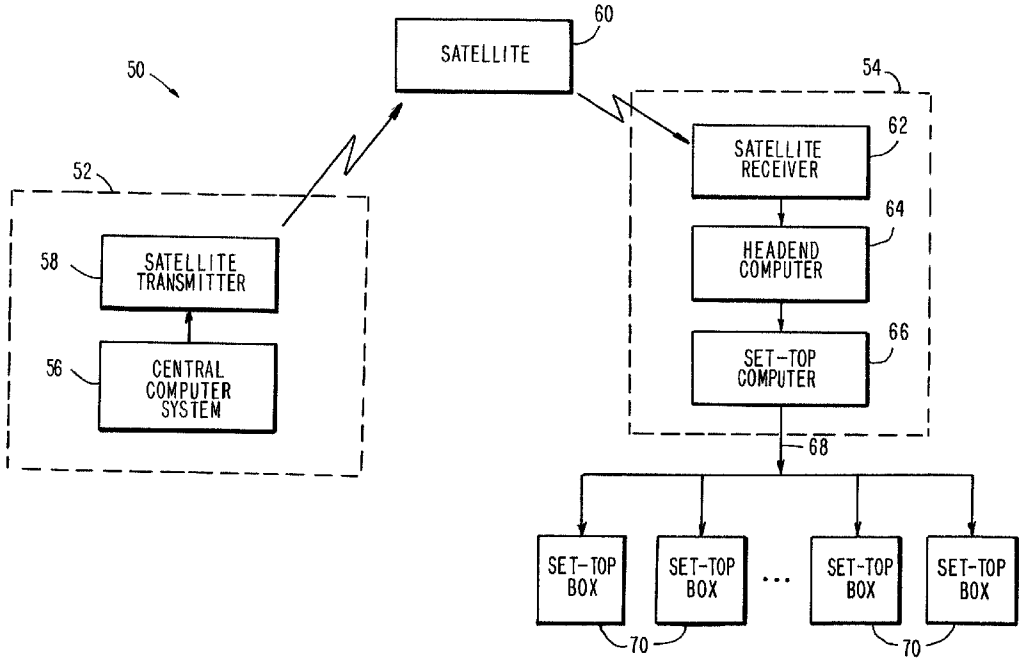
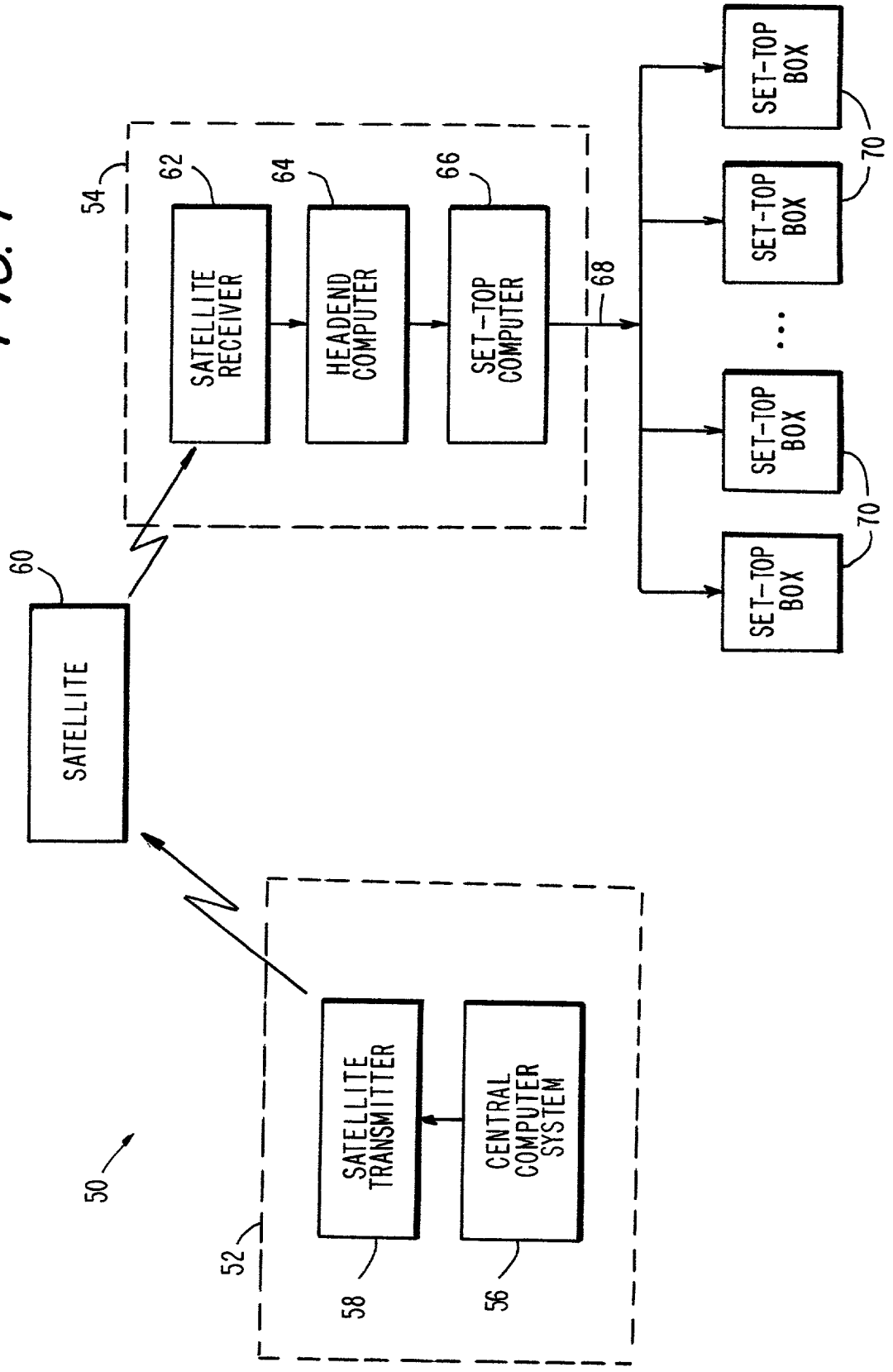


FIG. 1


50
52
54
56
58
60
62
64
66
68
70
70
70
SATELLITE TRANSMITTER
CENTRAL COMPUTER SYSTEM
SATELLITE
SATELLITE RECEIVER
HEADEND COMPUTER
SET-TOP COMPUTER
SET-TOP BOX
SET-TOP BOX
SET-TOP BOX
SET-TOP BOX

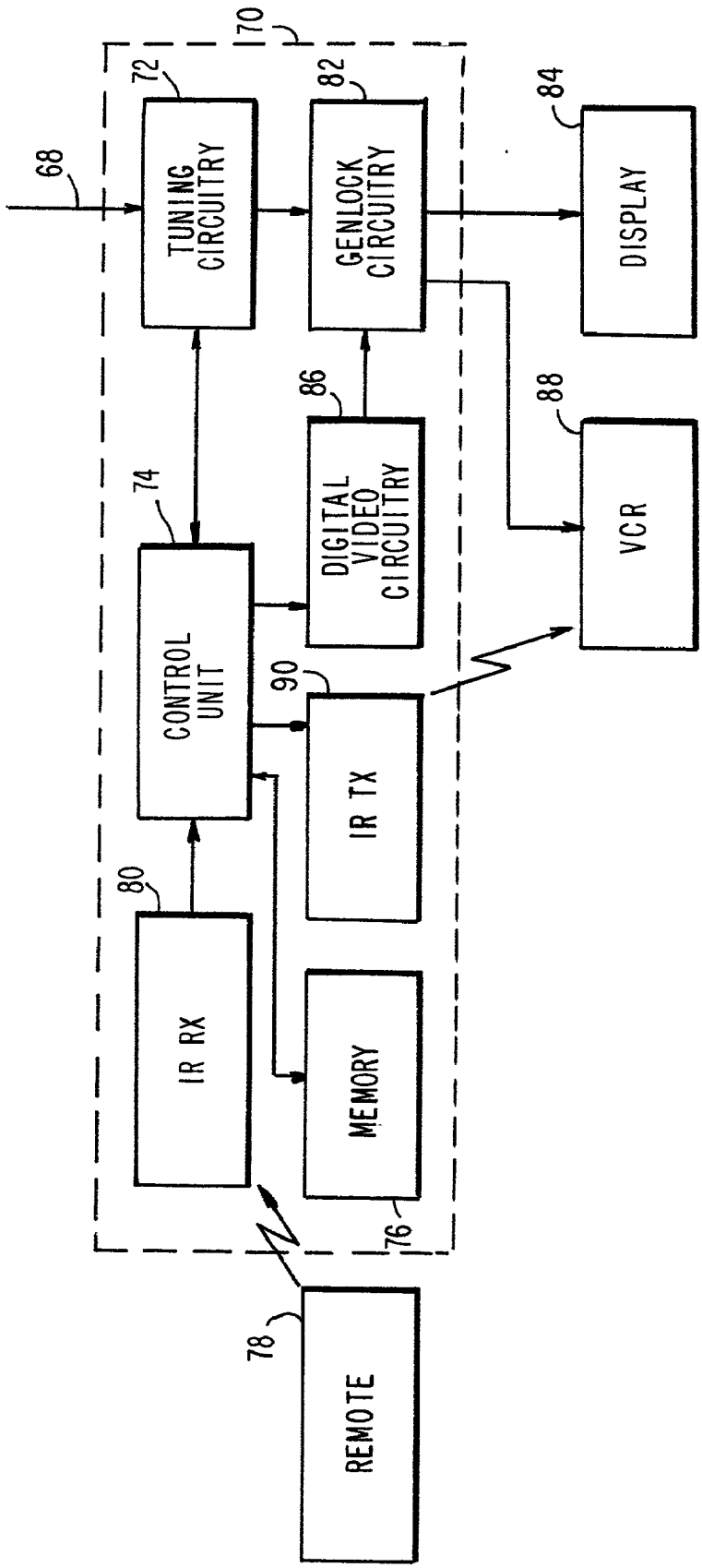

70
72
TUNING CIRCUITRY
82
GENLOCK CIRCUITRY
84
DISPLAY
68
86
88
74
DIGITAL VIDEO CIRCUITRY
VCR
CONTROL UNIT
90
IR TX
80
IR RX
MEMORY
76
78
REMOTE

FIG. 2

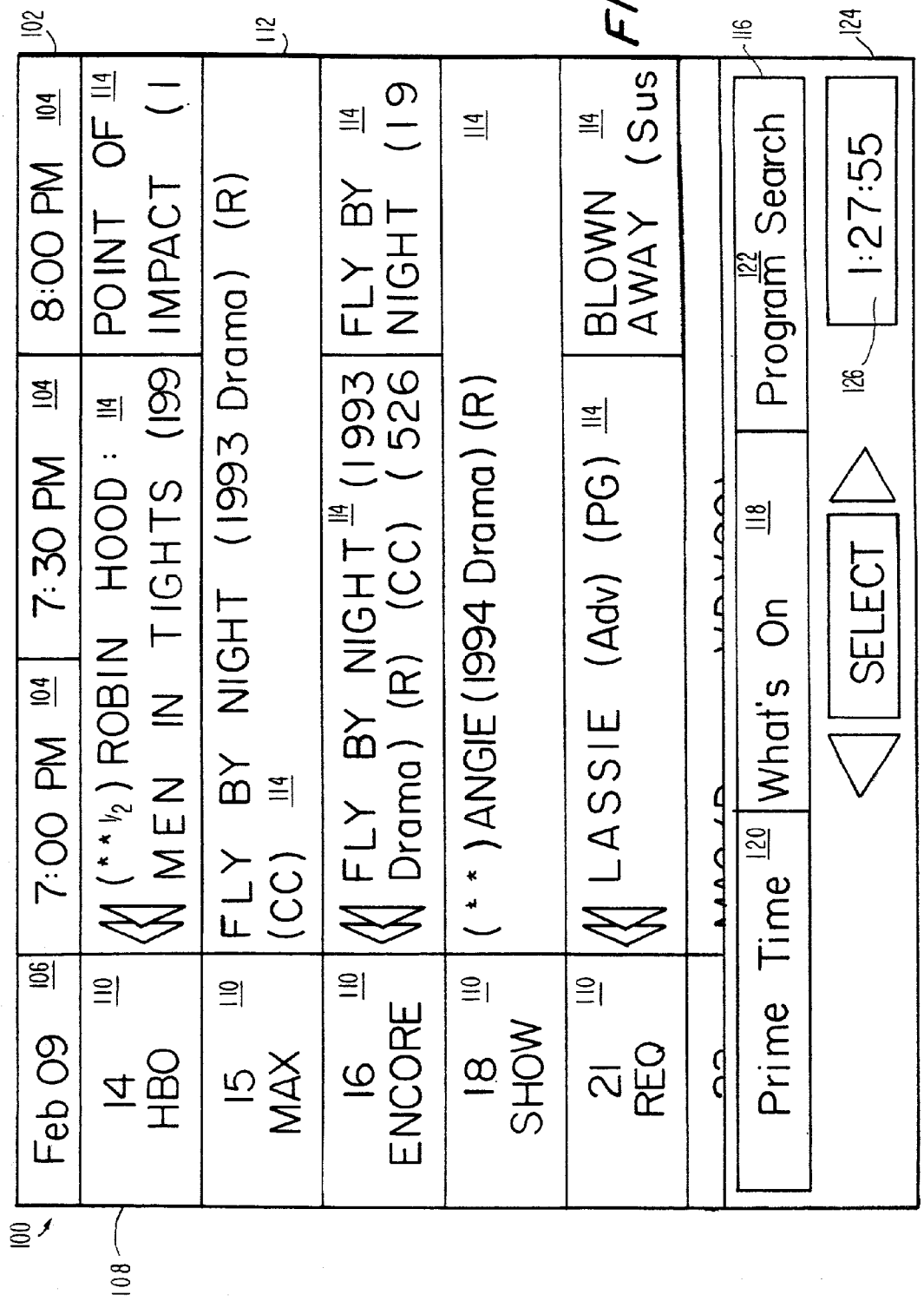

100
102
108
112
116
124
126
Feb 09 106
7:00 PM 104
7:30 PM 104
8:00 PM 104
14 HBO 110
(**½) ROBIN HOOD: MEN IN TIGHTS (199 114
POINT OF IMPACT (I 114
15 MAX 110
FLY BY NIGHT (1993 Drama) (R) (CC) 114
16 ENCORE 110
FLY BY NIGHT (1993 Drama) (R) (CC) (526 114
FLY BY NIGHT 114
18 SHOW 110
(***) ANGIE (1994 Drama) (R) 114
21 REQ 110
LASSIE (Adv) (PG) 114
BLOWN AWAY (Sus 114
Prime Time 120
What's On 118
Program Search 122
SELECT
1:27:55

FIG.3

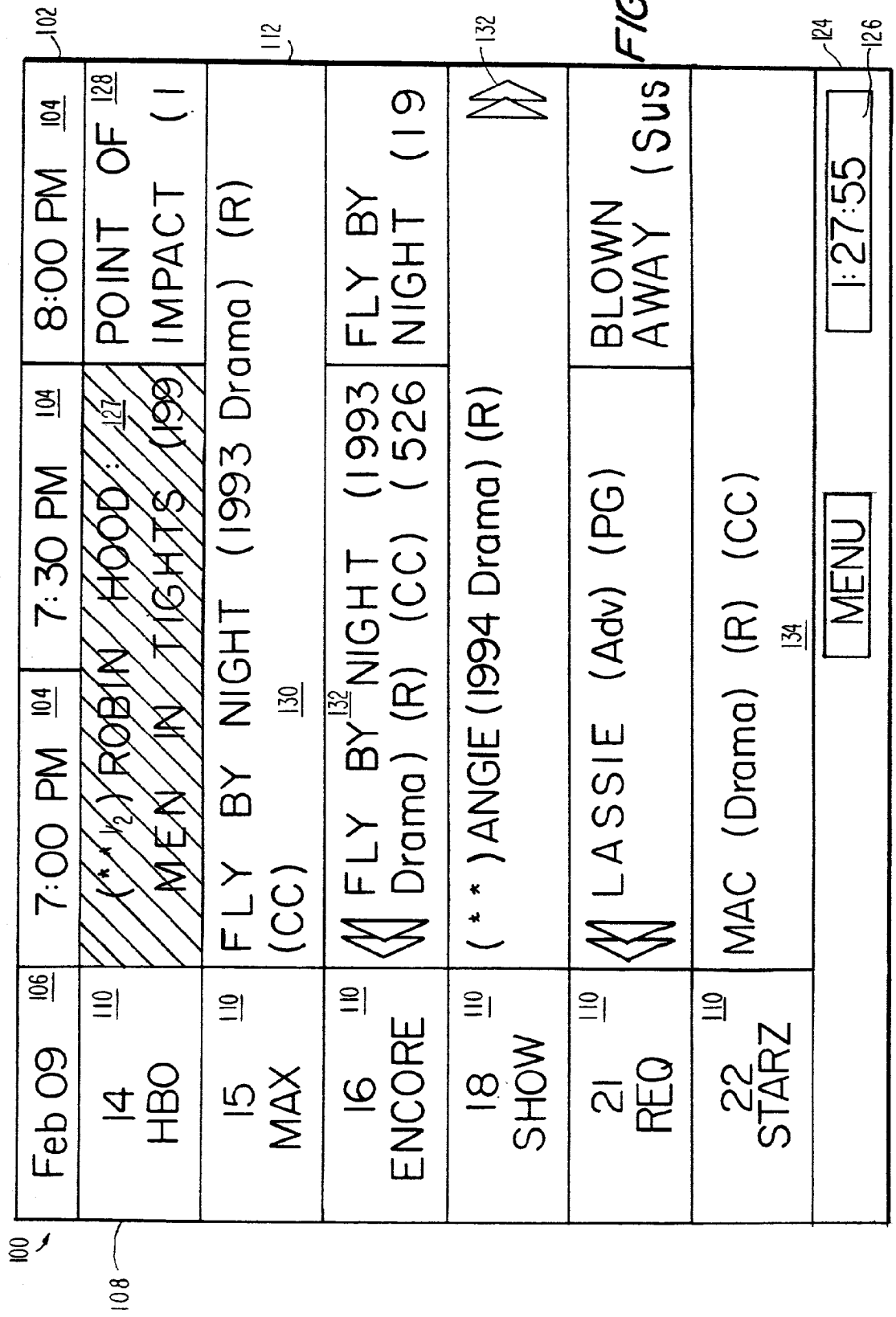

100
102
108
Feb 09 106
7:00 PM 104
7:30 PM 104
8:00 PM 104
14 HBO 110
(** 1/2) ROBIN HOOD : MEN IN TIGHTS (199 127
POINT OF IMPACT (128
15 MAX 110
FLY BY NIGHT (1993 Drama) (R) (CC) 130
112
16 ENCORE 110
FLY BY NIGHT (1993 Drama) (R) (CC) (526 132
FLY BY NIGHT (19
18 SHOW 110
(* *) ANGIE (1994 Drama) (R)
132
21 REQ 110
LASSIE (Adv) (PG)
BLOWN AWAY (Sus
22 STARZ 110
MAC (Drama) (R) (CC) 134
124
MENU
1:27:55
126

FIG. 4

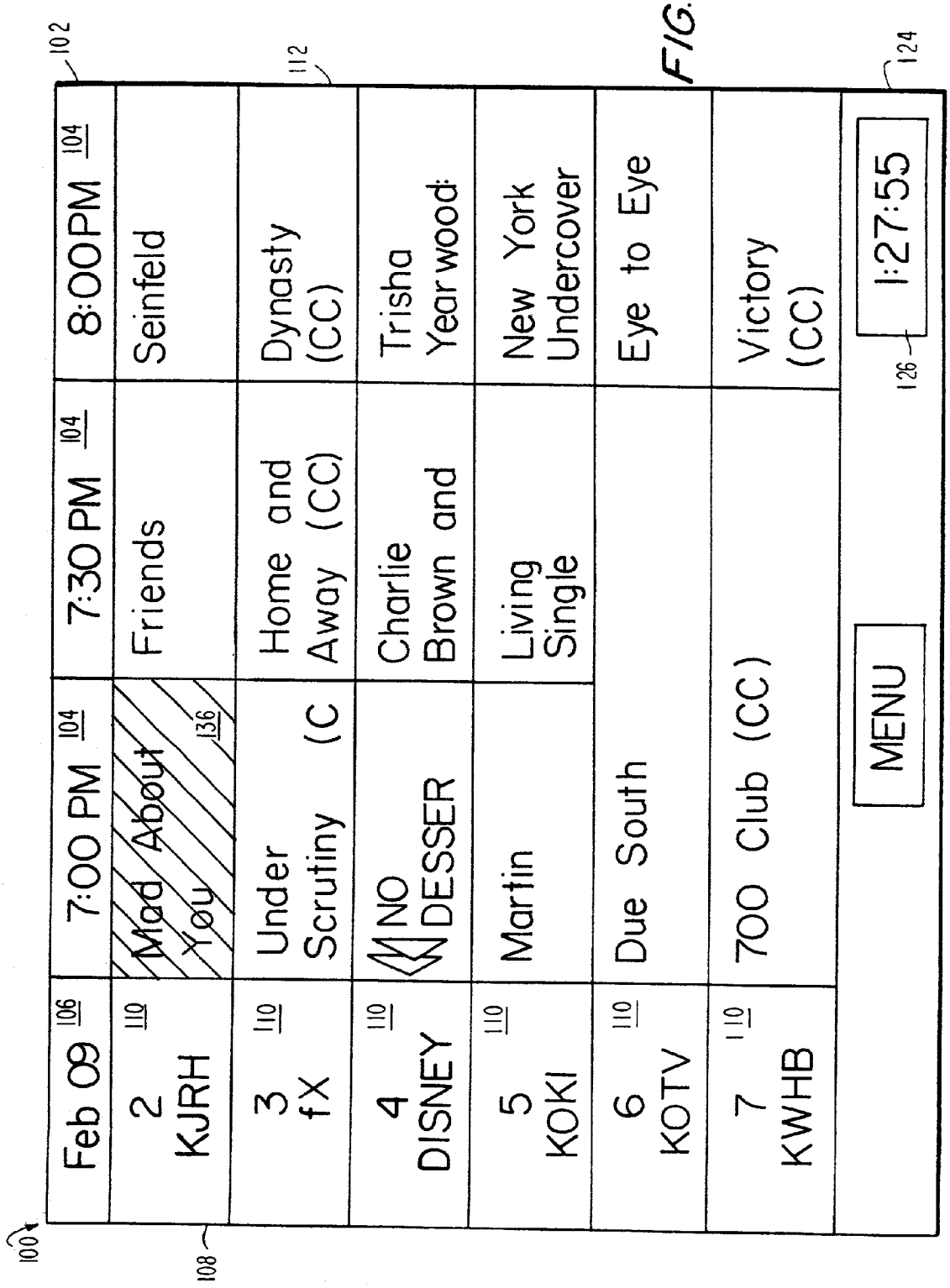

100
102
104
106
108
110
112
124
126
136
Feb 09
7:00 PM
7:30 PM
8:00PM
2 KJRH
3 fX
4 DISNEY
5 KOKI
6 KOTV
7 KWHB
Mad About You
Friends
Seinfeld
Under Scrutiny (C
Home and Away (CC)
Dynasty (CC)
NO DESSER
Charlie Brown and
Trisha Yearwood:
Martin
Living Single
New York Undercover
Due South
Eye to Eye
700 Club (CC)
Victory (CC)
MENU
1:27:55

FIG.5

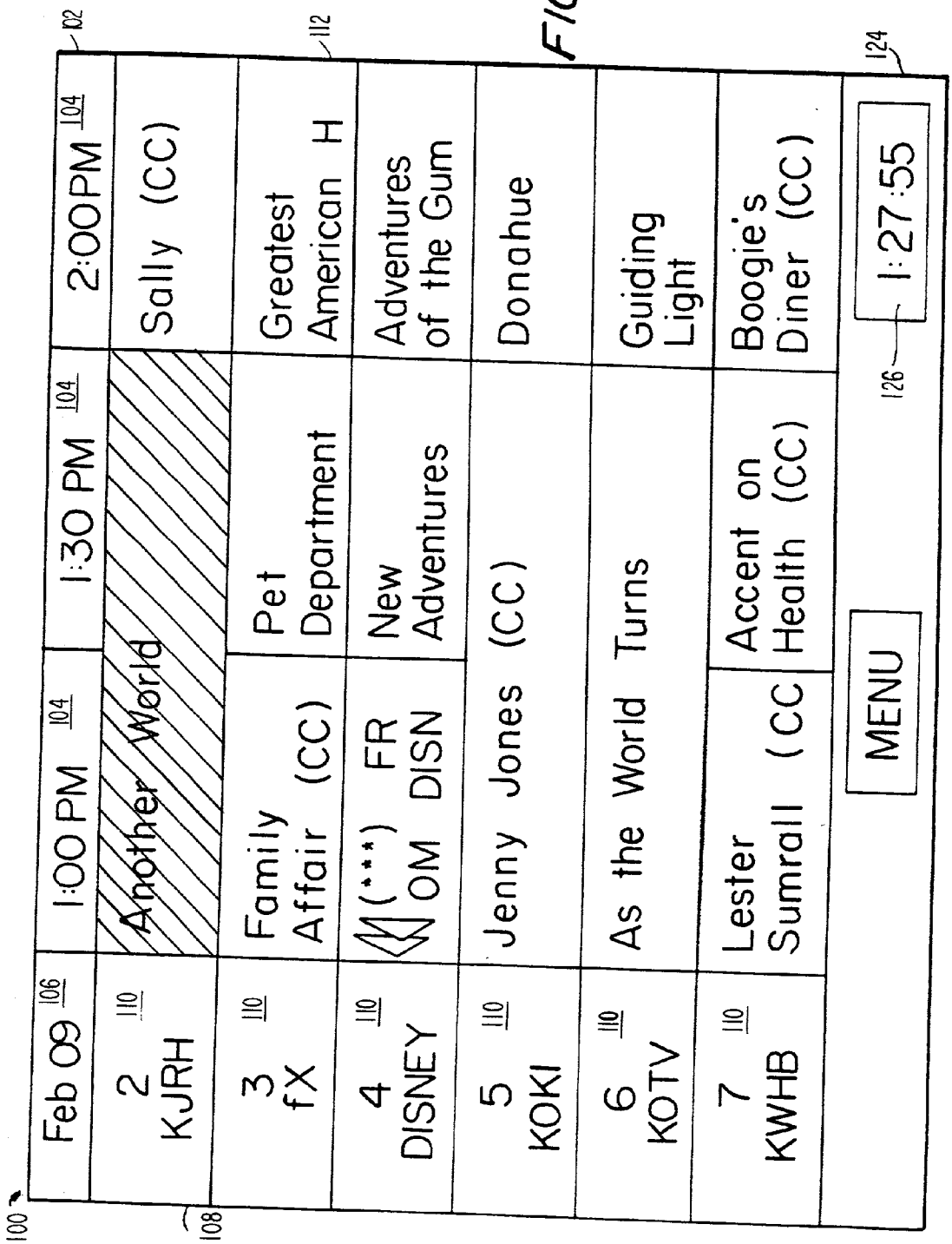

100
Feb 09 106
1:00 PM 104
1:30 PM 104
2:00PM 104
102
2 110 KJRH
3 110 fX
4 110 DISNEY
5 110 KOKI
6 110 KOTV
7 110 KWHB
Another World
Family Affair (CC)
(***) FR OM DISN
Jenny Jones (CC)
As the World Turns
Lester Sumrall (CC
Pet Department
New Adventures
Accent on Health (CC)
Sally (CC)
Greatest American H
112
Adventures of the Gum
Donahue
Guiding Light
Boogie's Diner (CC)
108
MENU
126
1:27:55
124

FIG.6

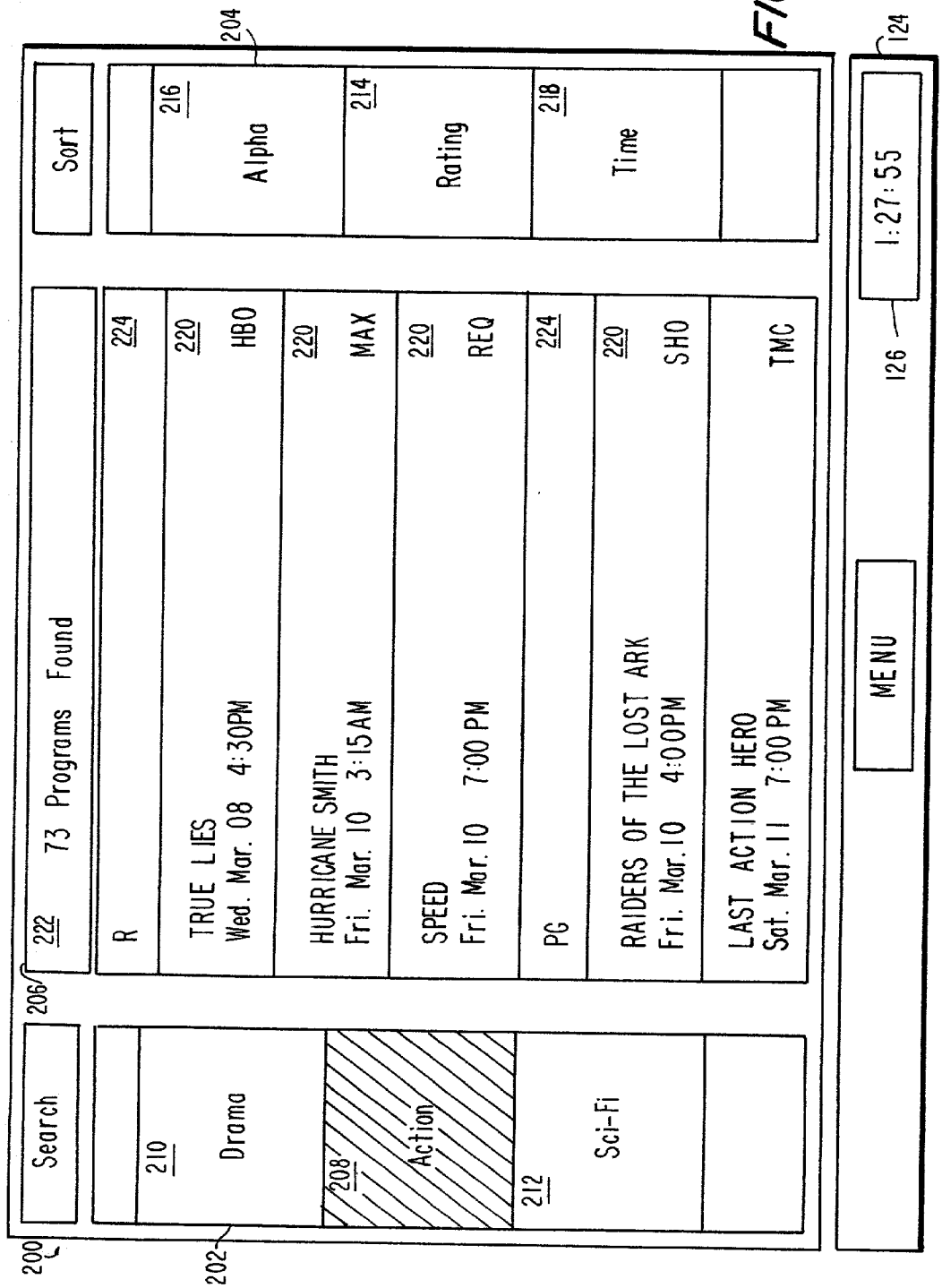

200
202
Search
210
Drama
208
Action
212
Sci-Fi
206
222
73 Programs Found
224
R
220
TRUE LIES
Wed. Mar. 08 4:30PM
HBO
220
HURRICANE SMITH
Fri. Mar. 10 3:15AM
MAX
220
SPEED
Fri. Mar. 10 7:00 PM
REQ
224
PG
220
RAIDERS OF THE LOST ARK
Fri. Mar. 10 4:00PM
SHO
LAST ACTION HERO
Sat. Mar. 11 7:00 PM
TMC
204
Sort
216
Alpha
214
Rating
218
Time
124
1:27:55
126
MENU

FIG.7

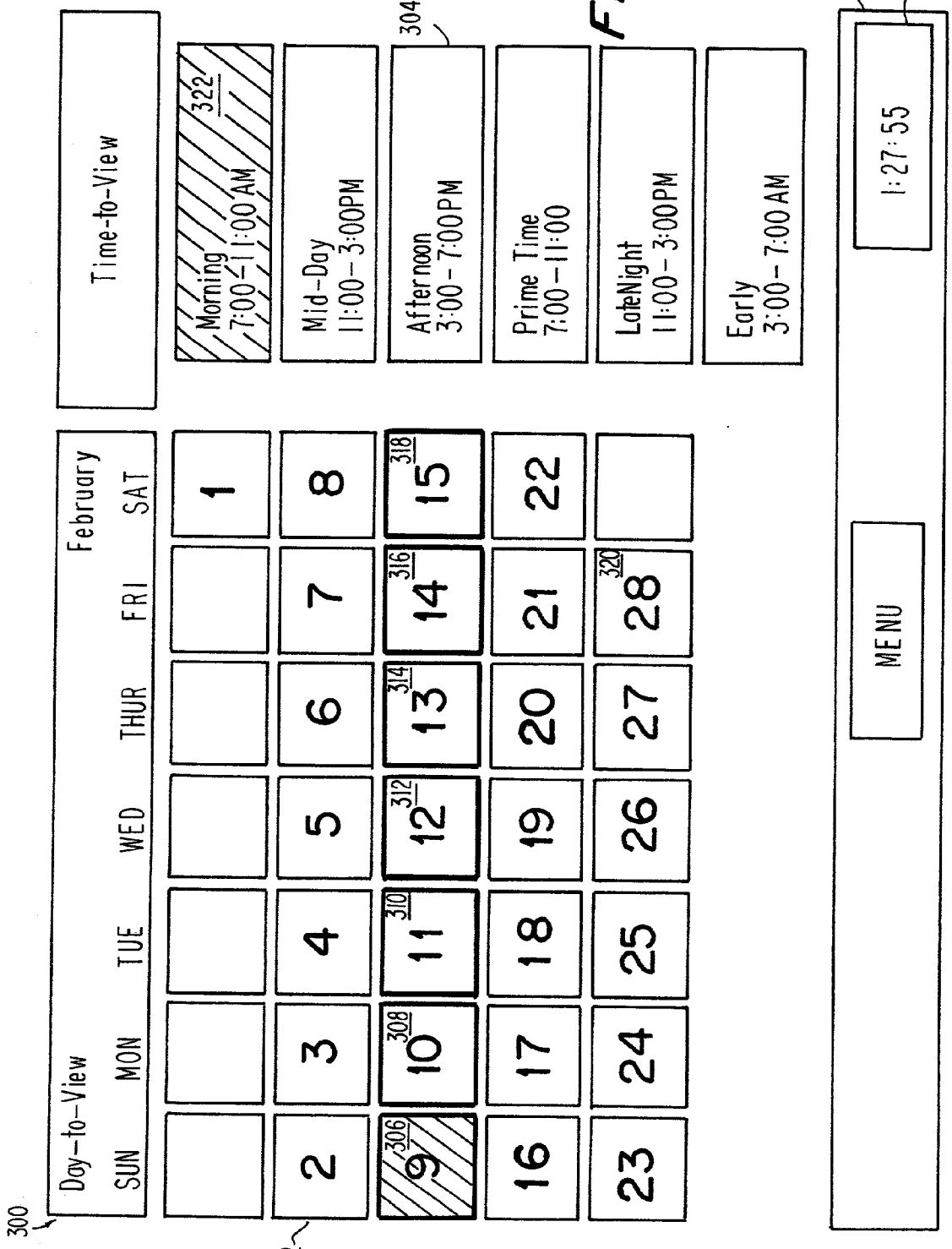
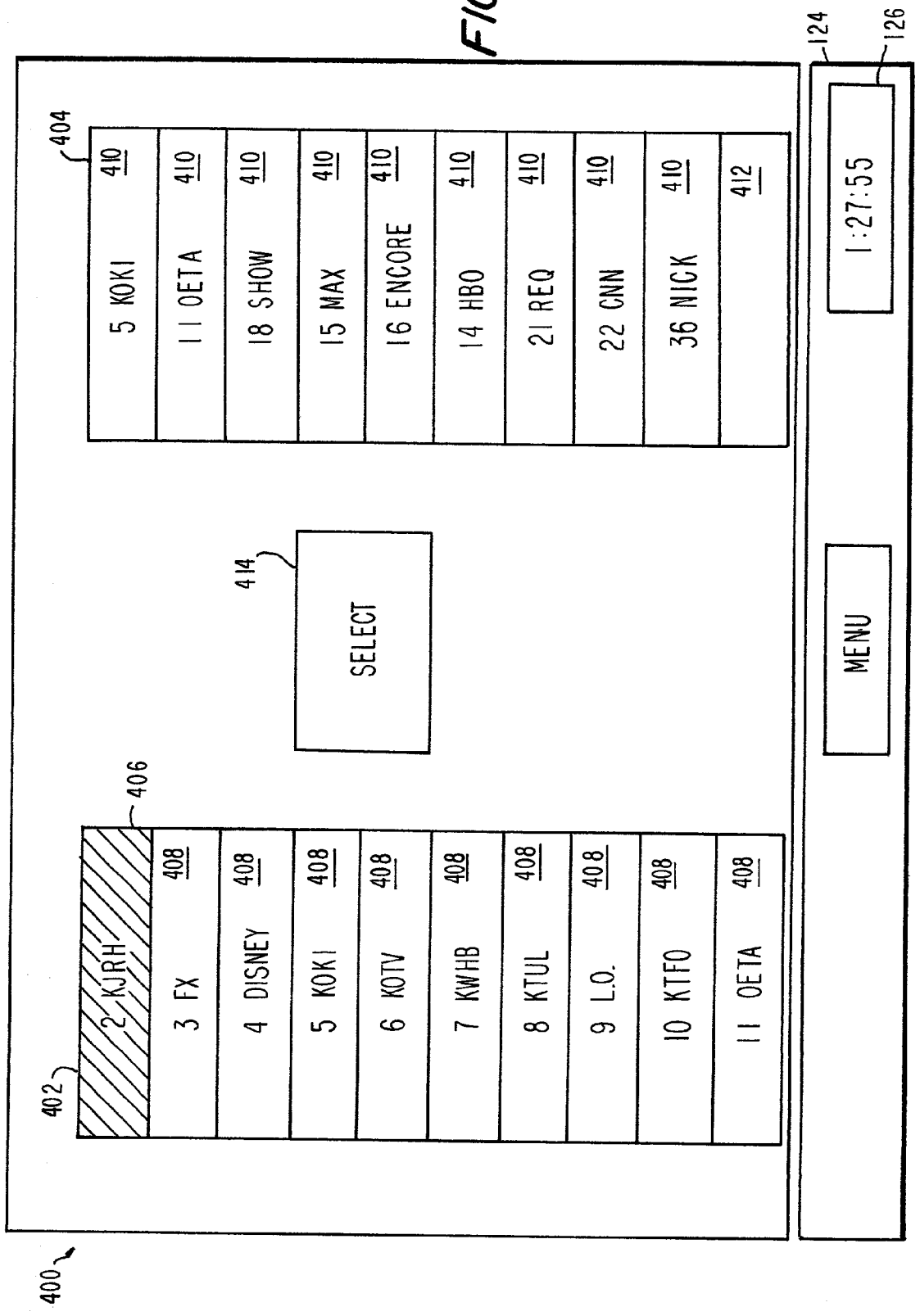

300
Day-to-View
February
SUN MON TUE WED THUR FRI SAT
1
2 3 4 5 6 7 8
9 10 11 12 13 14 15
16 17 18 19 20 21 22
23 24 25 26 27 28
302
306
308
310
312
314
316
318
320
322
Time-to-View
Morning 7:00-11:00 AM
Mid-Day 11:00-3:00PM
Afternoon 3:00-7:00PM
Prime Time 7:00-11:00
LateNight 11:00-3:00PM
Early 3:00-7:00 AM
304
MENU
1:27:55
124
126

FIG. 8

FIG. 9


400
402
2 KJRH 408
3 FX 408
4 DISNEY 408
5 KOKI 408
6 KOTV 408
7 KWHB 408
8 KTUL 408
9 L.O. 408
10 KTFO 408
11 OETA 408
406
404
5 KOKI 410
11 OETA 410
18 SHOW 410
15 MAX 410
16 ENCORE 410
14 HBO 410
21 REQ 410
22 CNN 410
36 NICK 410
412
414
SELECT
MENU
124
126
1:27:55

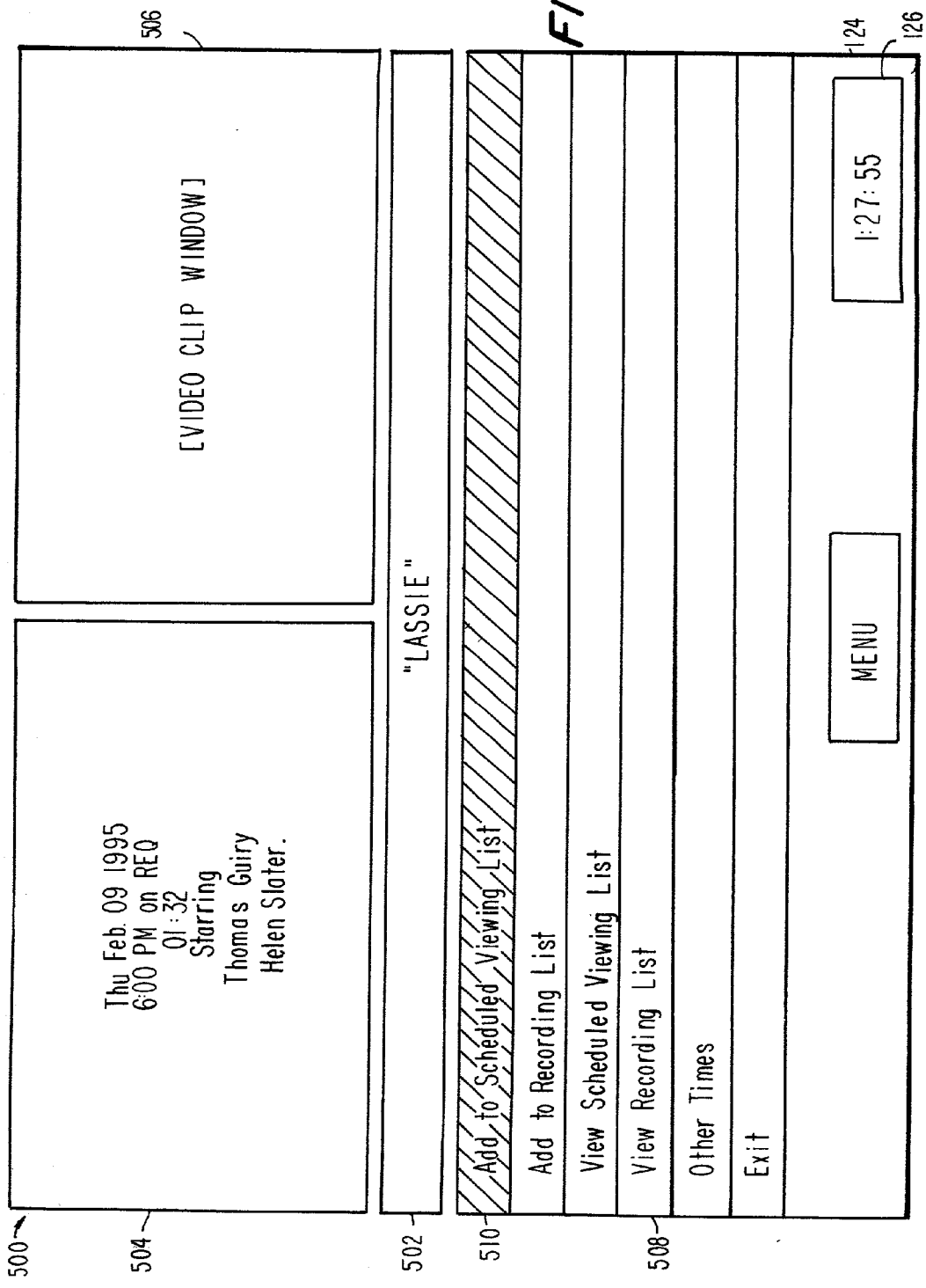
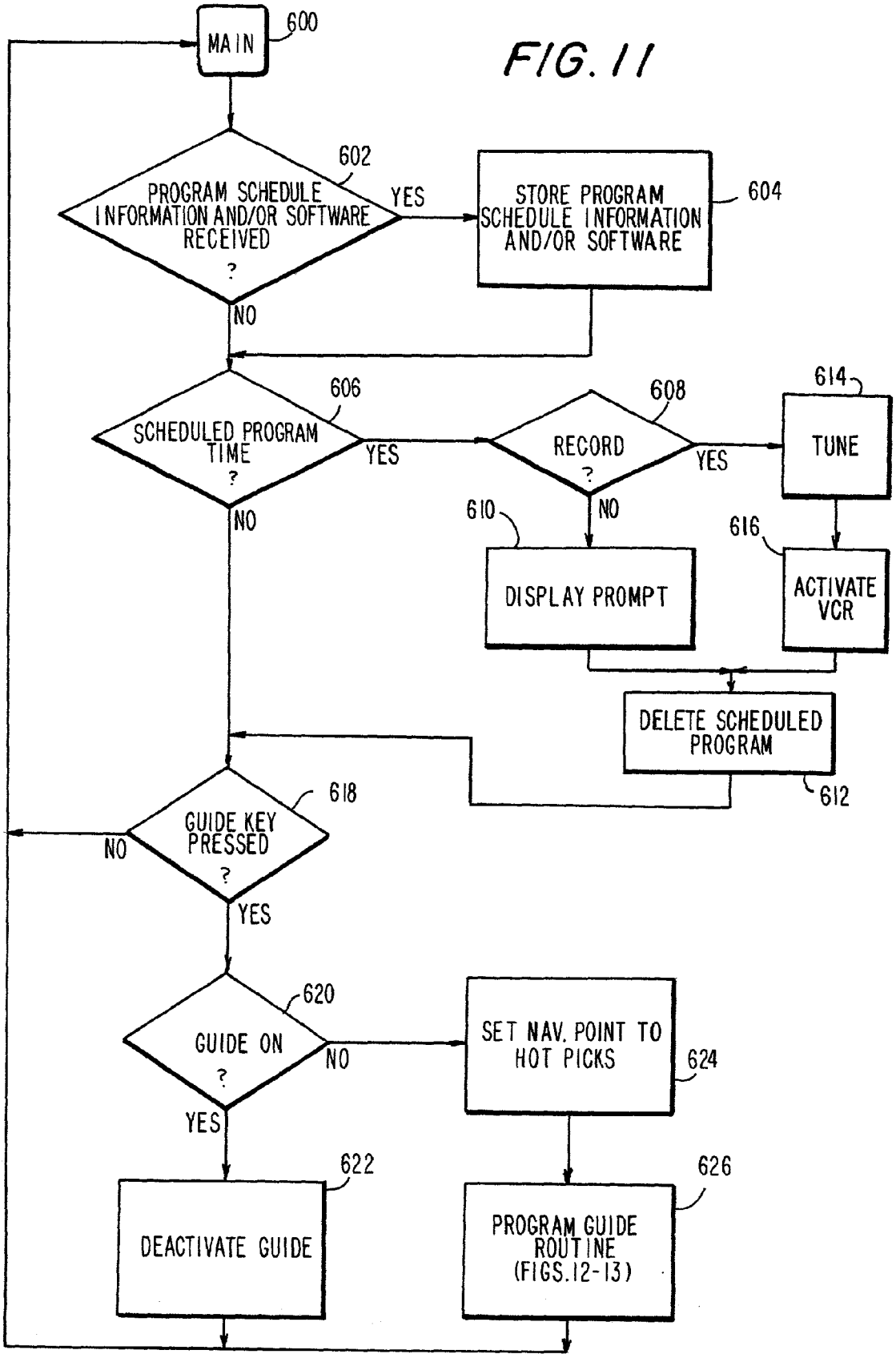

[VIDEO CLIP WINDOW]
506
Thu Feb 09 1995
6:00 PM on REQ
01:32
Starring
Thomas Guiry
Helen Slater.
"LASSIE"
Add to Scheduled Viewing List
Add to Recording List
View Scheduled Viewing List
View Recording List
Other Times
Exit
MENU
1:27:55
124
126
500
504
502
510
508

FIG.10

FIG. 11


MAIN
600
PROGRAM SCHEDULE INFORMATION AND/OR SOFTWARE RECEIVED ?
602
YES
STORE PROGRAM SCHEDULE INFORMATION AND/OR SOFTWARE
604
NO
SCHEDULED PROGRAM TIME ?
606
YES
RECORD ?
608
YES
TUNE
614
NO
DISPLAY PROMPT
610
ACTIVATE VCR
616
DELETE SCHEDULED PROGRAM
612
GUIDE KEY PRESSED ?
618
NO
YES
GUIDE ON ?
620
NO
SET NAV. POINT TO HOT PICKS
624
YES
DEACTIVATE GUIDE
622
PROGRAM GUIDE ROUTINE (FIGS. 12-13)
626

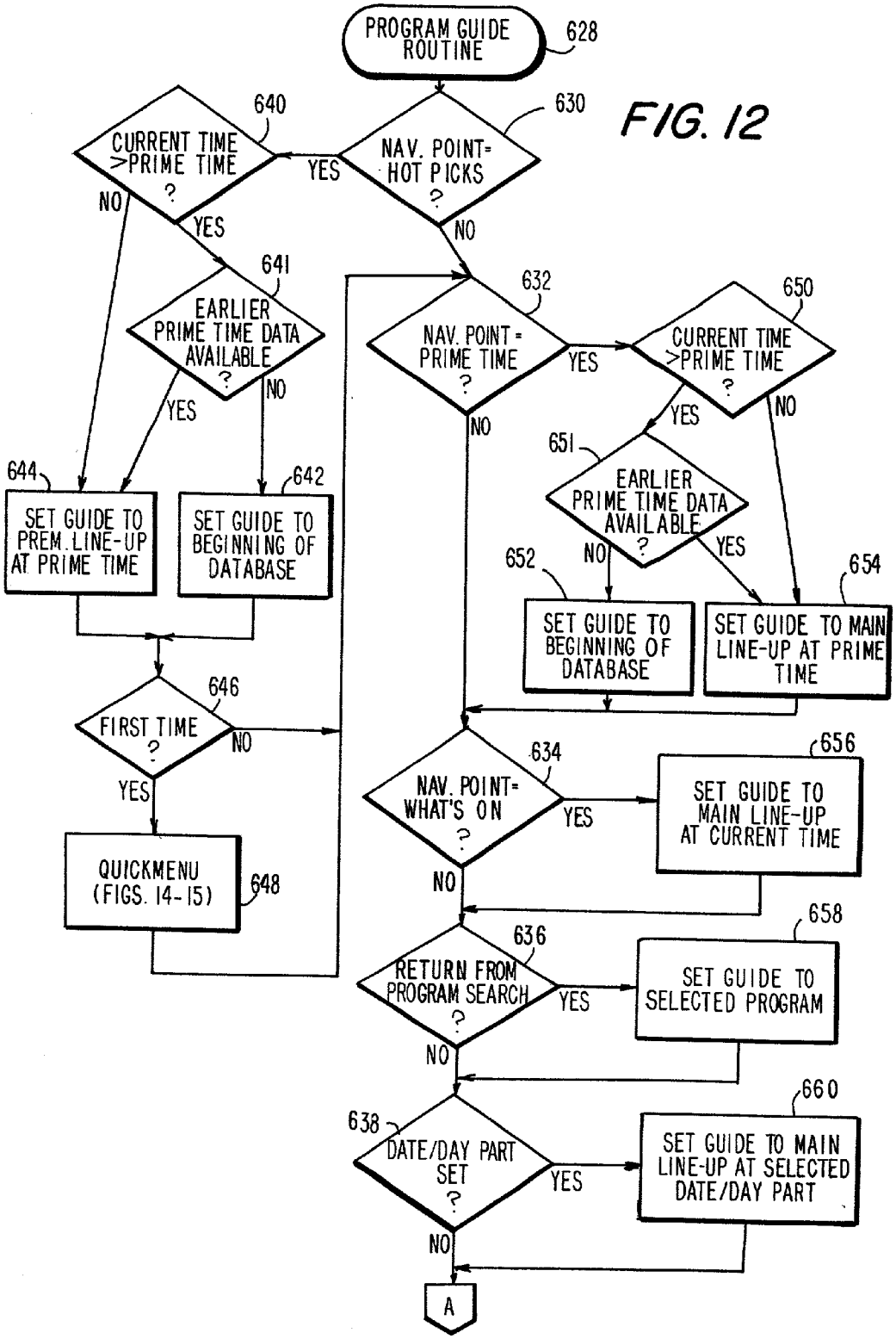
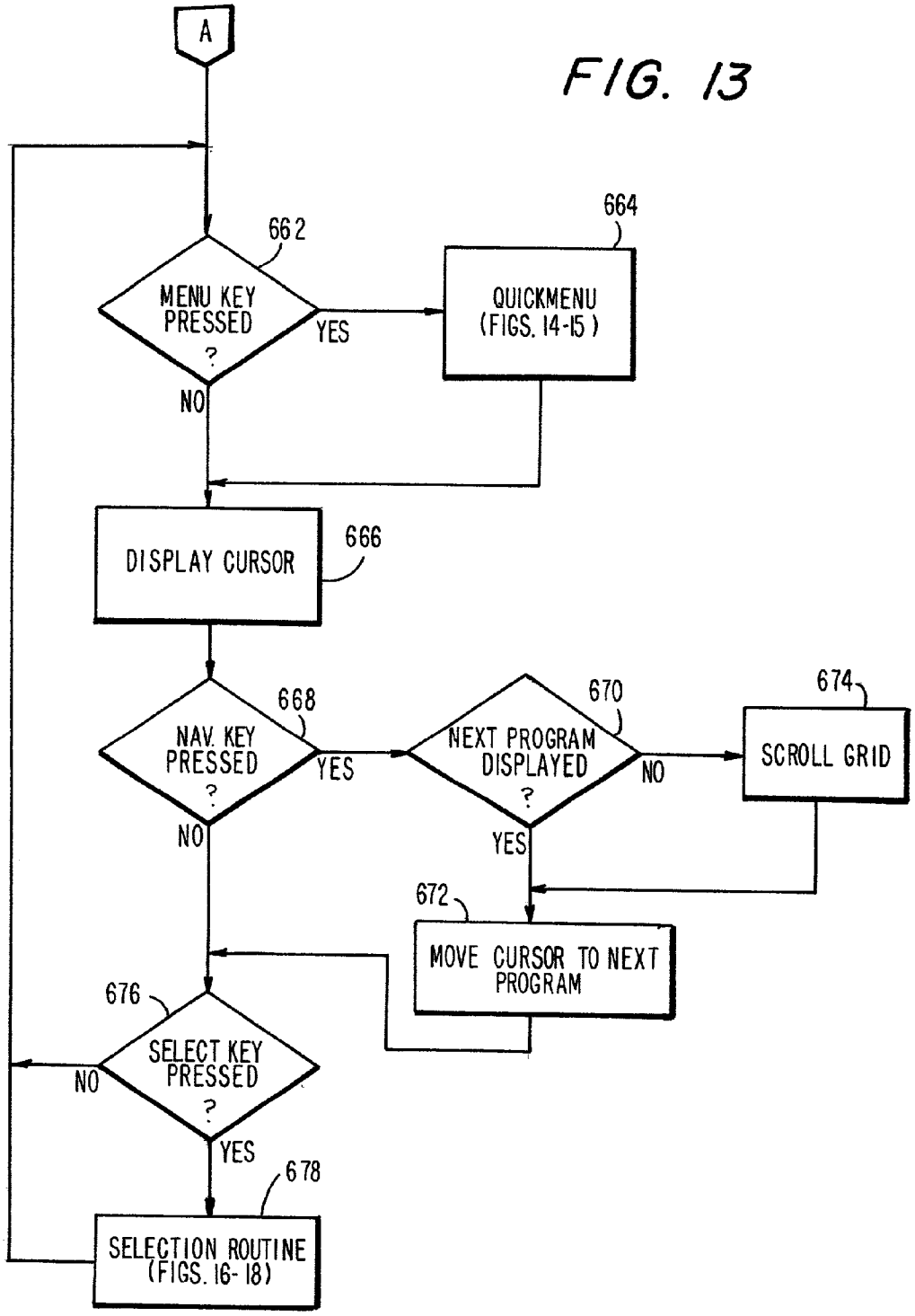

PROGRAM GUIDE ROUTINE
628
NAV. POINT= HOT PICKS ?
630
YES
NO
CURRENT TIME >PRIME TIME ?
640
NO
YES
EARLIER PRIME TIME DATA AVAILABLE ?
641
YES
NO
SET GUIDE TO PREM. LINE-UP AT PRIME TIME
644
SET GUIDE TO BEGINNING OF DATABASE
642
FIRST TIME ?
646
NO
YES
QUICKMENU (FIGS. 14-15)
648
NAV. POINT = PRIME TIME ?
632
YES
NO
CURRENT TIME >PRIME TIME ?
650
YES
NO
EARLIER PRIME TIME DATA AVAILABLE ?
651
NO
YES
SET GUIDE TO BEGINNING OF DATABASE
652
SET GUIDE TO MAIN LINE-UP AT PRIME TIME
654
NAV. POINT= WHAT'S ON ?
634
YES
NO
SET GUIDE TO MAIN LINE-UP AT CURRENT TIME
656
RETURN FROM PROGRAM SEARCH ?
636
YES
NO
SET GUIDE TO SELECTED PROGRAM
658
DATE/DAY PART SET ?
638
YES
NO
SET GUIDE TO MAIN LINE-UP AT SELECTED DATE/DAY PART
660
A

FIG. 12

FIG. 13


A
662
MENU KEY PRESSED ?
YES
NO
664
QUICKMENU (FIGS. 14-15)
DISPLAY CURSOR
666
668
NAV. KEY PRESSED ?
YES
NO
670
NEXT PROGRAM DISPLAYED ?
NO
YES
674
SCROLL GRID
672
MOVE CURSOR TO NEXT PROGRAM
676
SELECT KEY PRESSED ?
NO
YES
678
SELECTION ROUTINE (FIGS. 16-18)

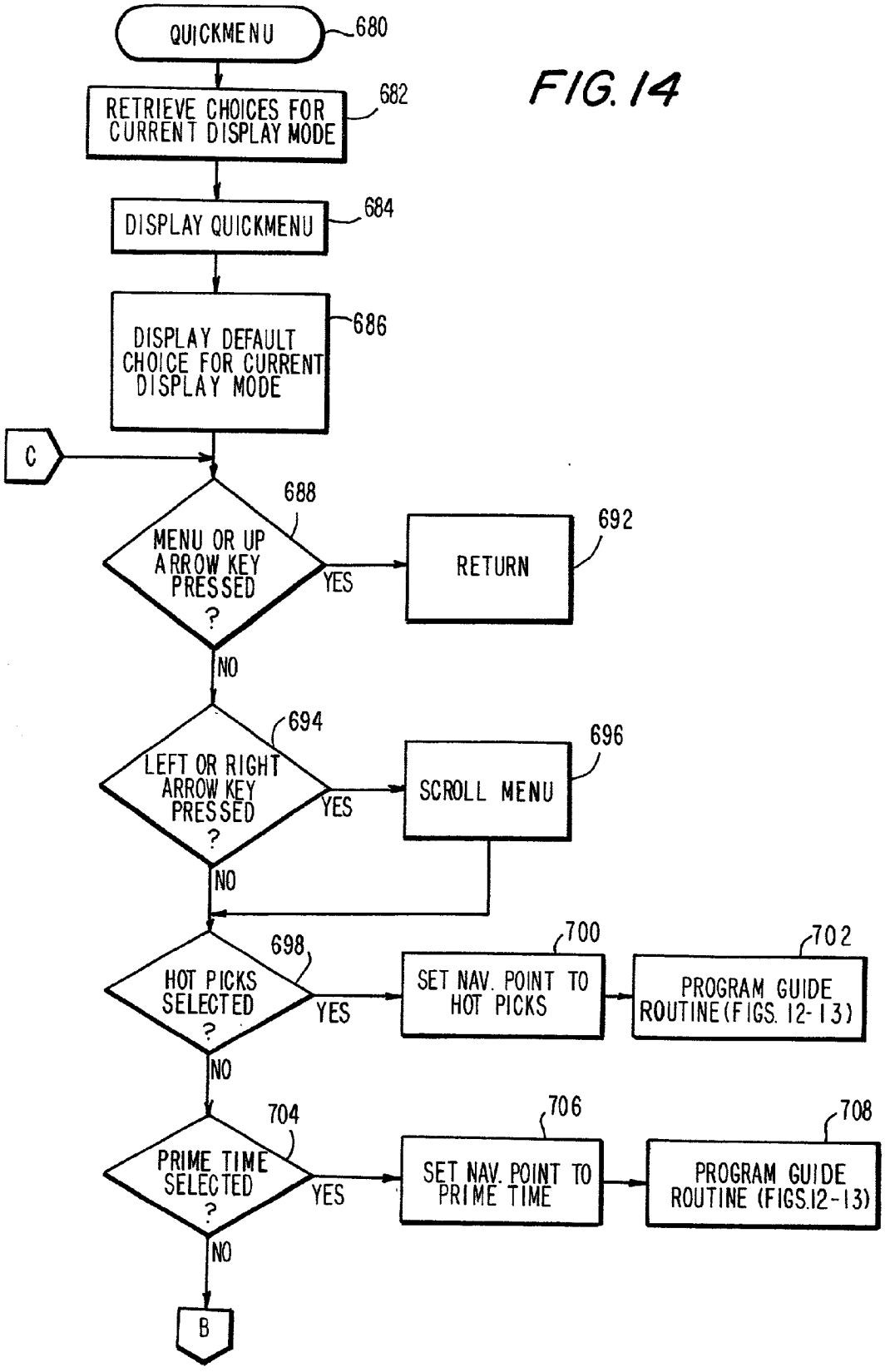
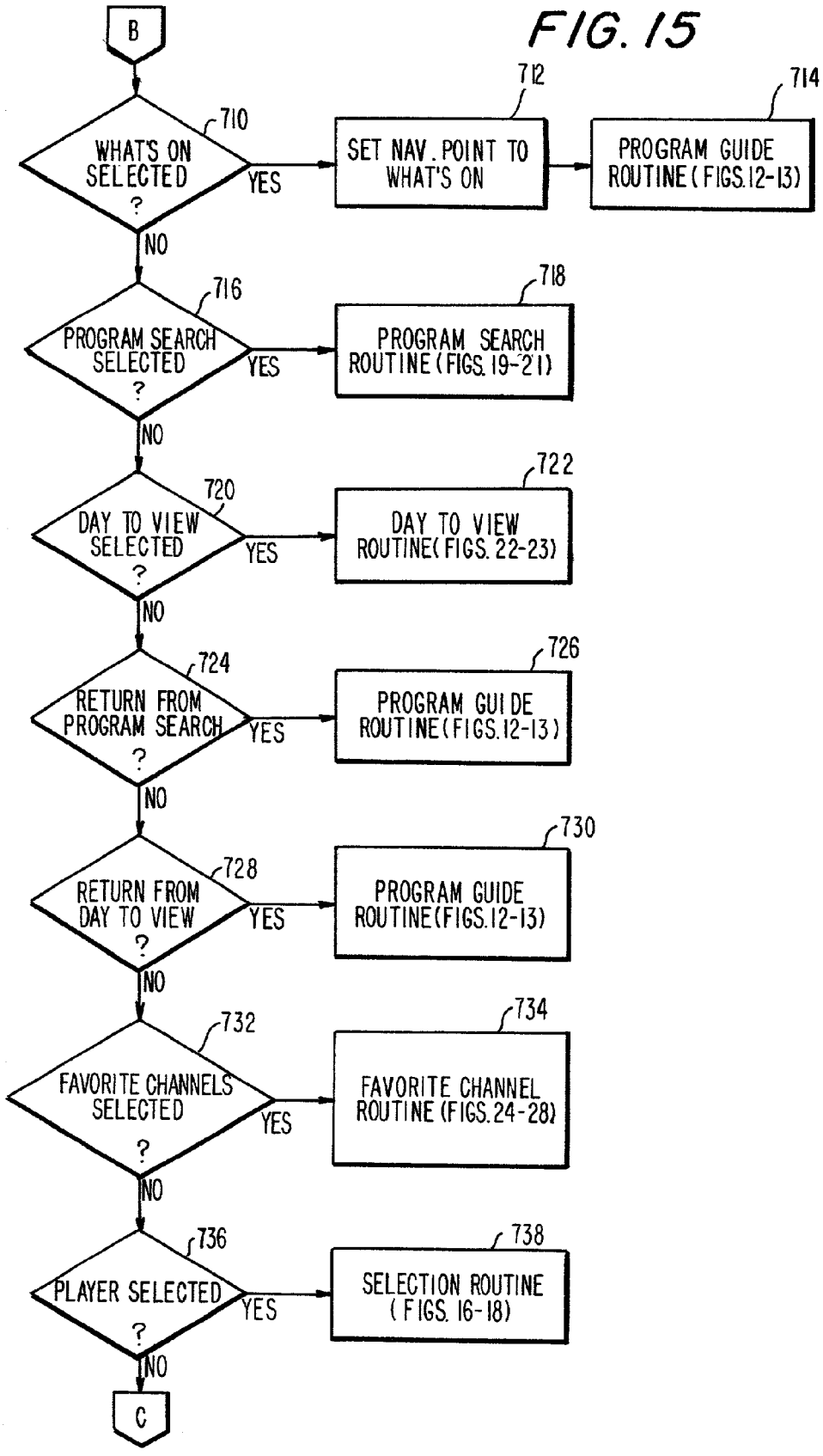

QUICKMENU
680
RETRIEVE CHOICES FOR CURRENT DISPLAY MODE
682
DISPLAY QUICKMENU
684
DISPLAY DEFAULT CHOICE FOR CURRENT DISPLAY MODE
686
C
MENU OR UP ARROW KEY PRESSED ?
688
YES
RETURN
692
NO
LEFT OR RIGHT ARROW KEY PRESSED ?
694
YES
SCROLL MENU
696
NO
HOT PICKS SELECTED ?
698
YES
SET NAV. POINT TO HOT PICKS
700
PROGRAM GUIDE ROUTINE (FIGS. 12-13)
702
NO
PRIME TIME SELECTED ?
704
YES
SET NAV. POINT TO PRIME TIME
706
PROGRAM GUIDE ROUTINE (FIGS. 12-13)
708
NO
B

FIG. 14

FIG. 15


B
710
WHAT'S ON SELECTED ?
YES
712
SET NAV. POINT TO WHAT'S ON
714
PROGRAM GUIDE ROUTINE (FIGS. 12-13)
NO
716
PROGRAM SEARCH SELECTED ?
YES
718
PROGRAM SEARCH ROUTINE (FIGS. 19-21)
NO
720
DAY TO VIEW SELECTED ?
YES
722
DAY TO VIEW ROUTINE (FIGS. 22-23)
NO
724
RETURN FROM PROGRAM SEARCH ?
YES
726
PROGRAM GUIDE ROUTINE (FIGS. 12-13)
NO
728
RETURN FROM DAY TO VIEW ?
YES
730
PROGRAM GUIDE ROUTINE (FIGS. 12-13)
NO
732
FAVORITE CHANNELS SELECTED ?
YES
734
FAVORITE CHANNEL ROUTINE (FIGS. 24-28)
NO
736
PLAYER SELECTED ?
YES
738
SELECTION ROUTINE (FIGS. 16-18)
NO
C

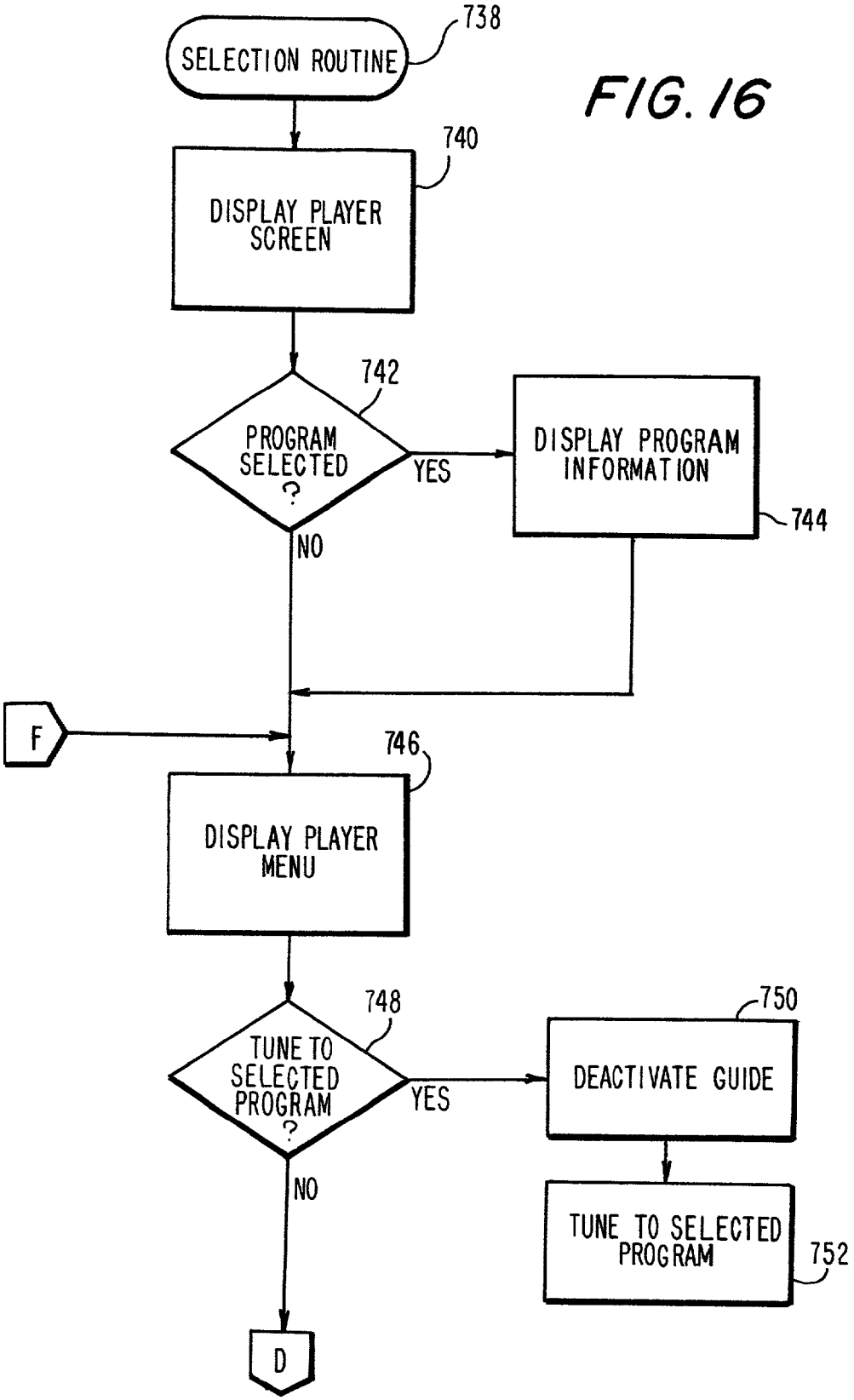

SELECTION ROUTINE
738
DISPLAY PLAYER SCREEN
740
PROGRAM SELECTED ?
742
YES
DISPLAY PROGRAM INFORMATION
744
NO
F
DISPLAY PLAYER MENU
746
TUNE TO SELECTED PROGRAM ?
748
YES
DEACTIVATE GUIDE
750
TUNE TO SELECTED PROGRAM
752
NO
D

FIG. 16

FIG. 17

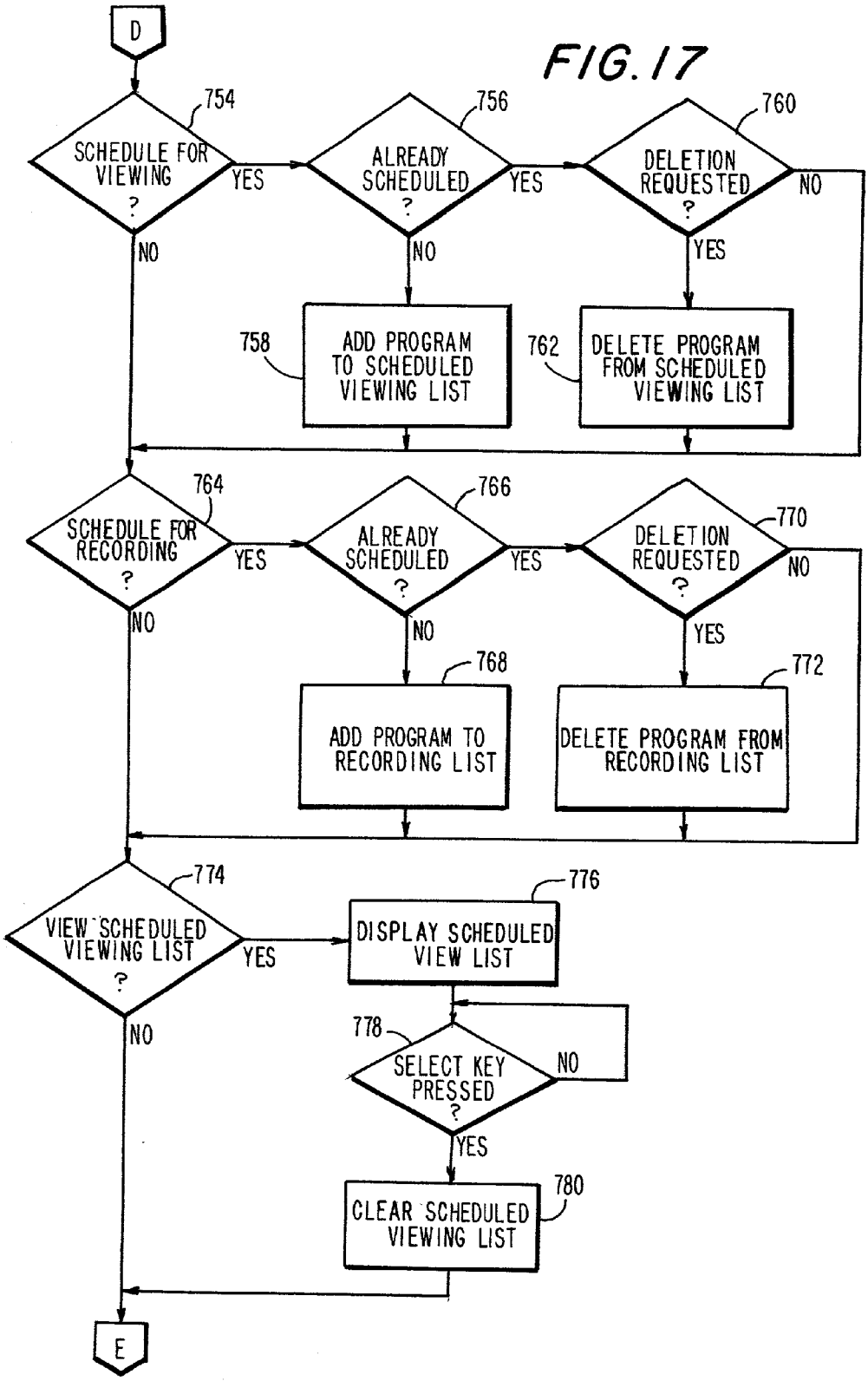
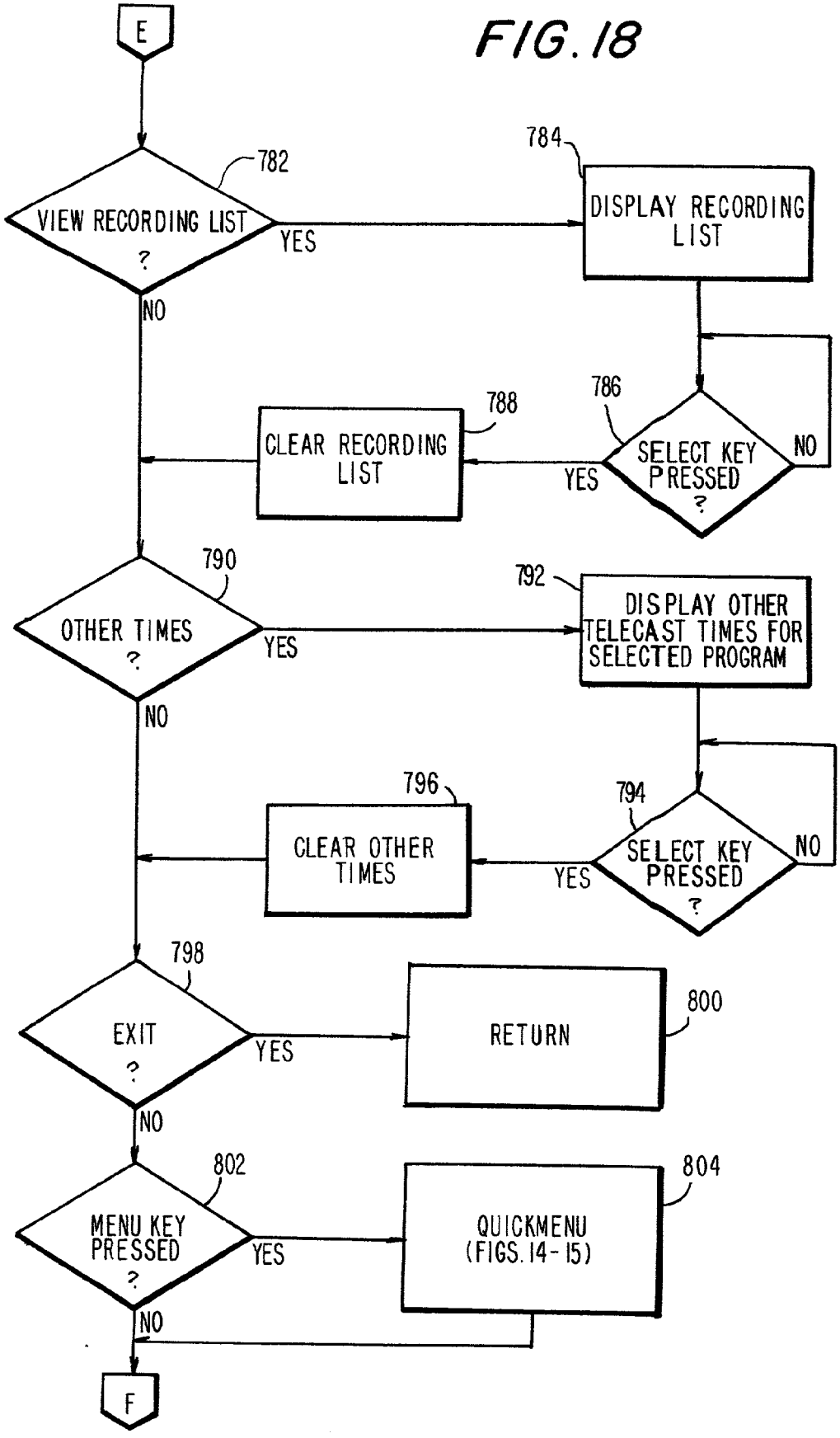

D
754
SCHEDULE FOR VIEWING ?
YES
NO
756
ALREADY SCHEDULED ?
YES
NO
760
DELETION REQUESTED ?
NO
YES
758
ADD PROGRAM TO SCHEDULED VIEWING LIST
762
DELETE PROGRAM FROM SCHEDULED VIEWING LIST
764
SCHEDULE FOR RECORDING ?
YES
NO
766
ALREADY SCHEDULED ?
YES
NO
770
DELETION REQUESTED ?
NO
YES
768
ADD PROGRAM TO RECORDING LIST
772
DELETE PROGRAM FROM RECORDING LIST
774
VIEW SCHEDULED VIEWING LIST ?
YES
NO
776
DISPLAY SCHEDULED VIEW LIST
778
SELECT KEY PRESSED ?
NO
YES
780
CLEAR SCHEDULED VIEWING LIST
E

FIG. 18


E
782
VIEW RECORDING LIST ?
YES
784
DISPLAY RECORDING LIST
NO
786
SELECT KEY PRESSED ?
NO
YES
788
CLEAR RECORDING LIST
790
OTHER TIMES ?
YES
792
DISPLAY OTHER TELECAST TIMES FOR SELECTED PROGRAM
NO
794
SELECT KEY PRESSED ?
NO
YES
796
CLEAR OTHER TIMES
798
EXIT ?
YES
800
RETURN
NO
802
MENU KEY PRESSED ?
YES
804
QUICKMENU (FIGS. 14-15)
NO
F

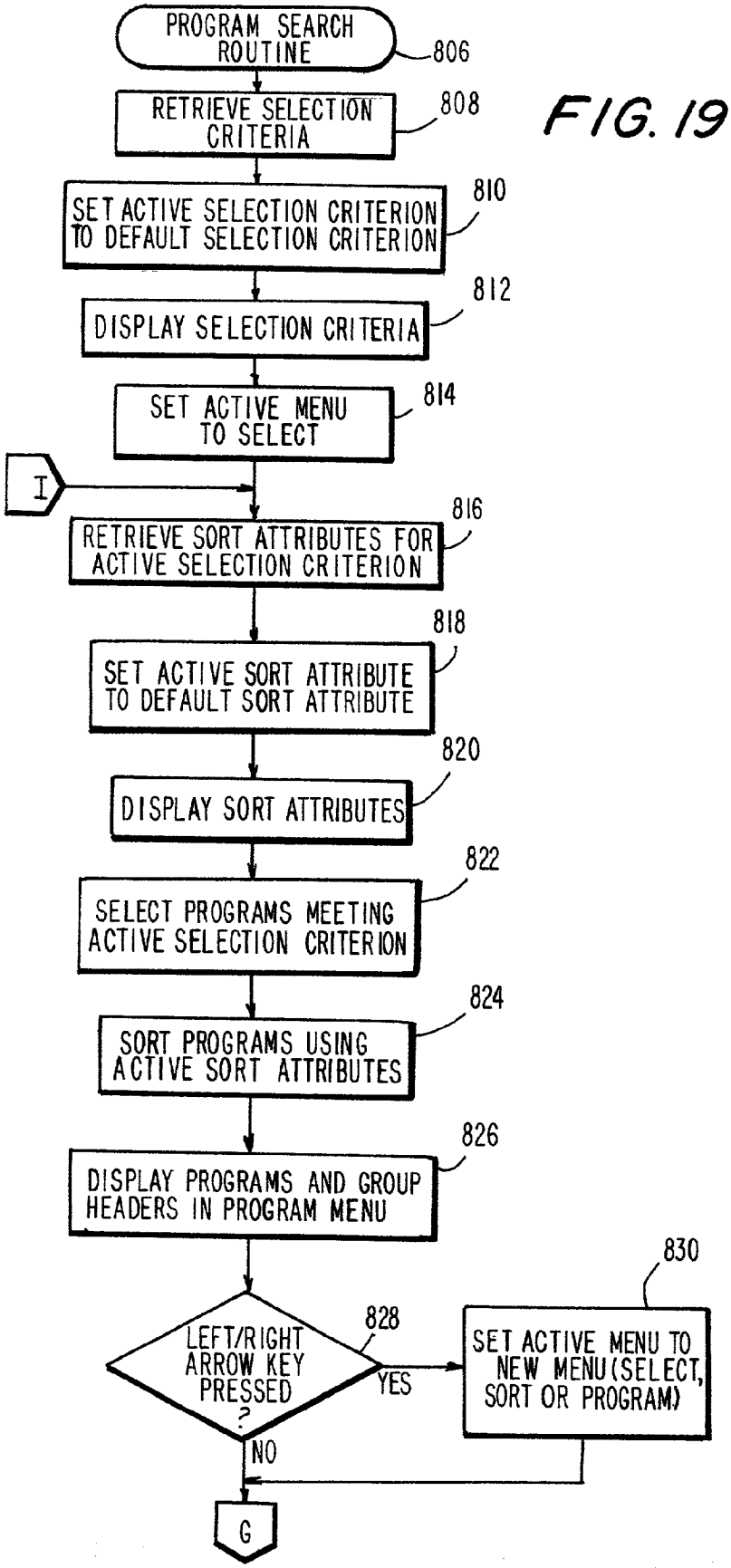

PROGRAM SEARCH ROUTINE
806
RETRIEVE SELECTION CRITERIA
808
SET ACTIVE SELECTION CRITERION TO DEFAULT SELECTION CRITERION
810
DISPLAY SELECTION CRITERIA
812
SET ACTIVE MENU TO SELECT
814
I
RETRIEVE SORT ATTRIBUTES FOR ACTIVE SELECTION CRITERION
816
SET ACTIVE SORT ATTRIBUTE TO DEFAULT SORT ATTRIBUTE
818
DISPLAY SORT ATTRIBUTES
820
SELECT PROGRAMS MEETING ACTIVE SELECTION CRITERION
822
SORT PROGRAMS USING ACTIVE SORT ATTRIBUTES
824
DISPLAY PROGRAMS AND GROUP HEADERS IN PROGRAM MENU
826
LEFT/RIGHT ARROW KEY PRESSED ?
828
YES
SET ACTIVE MENU TO NEW MENU (SELECT, SORT OR PROGRAM)
830
NO
G

FIG. 19

FIG. 20

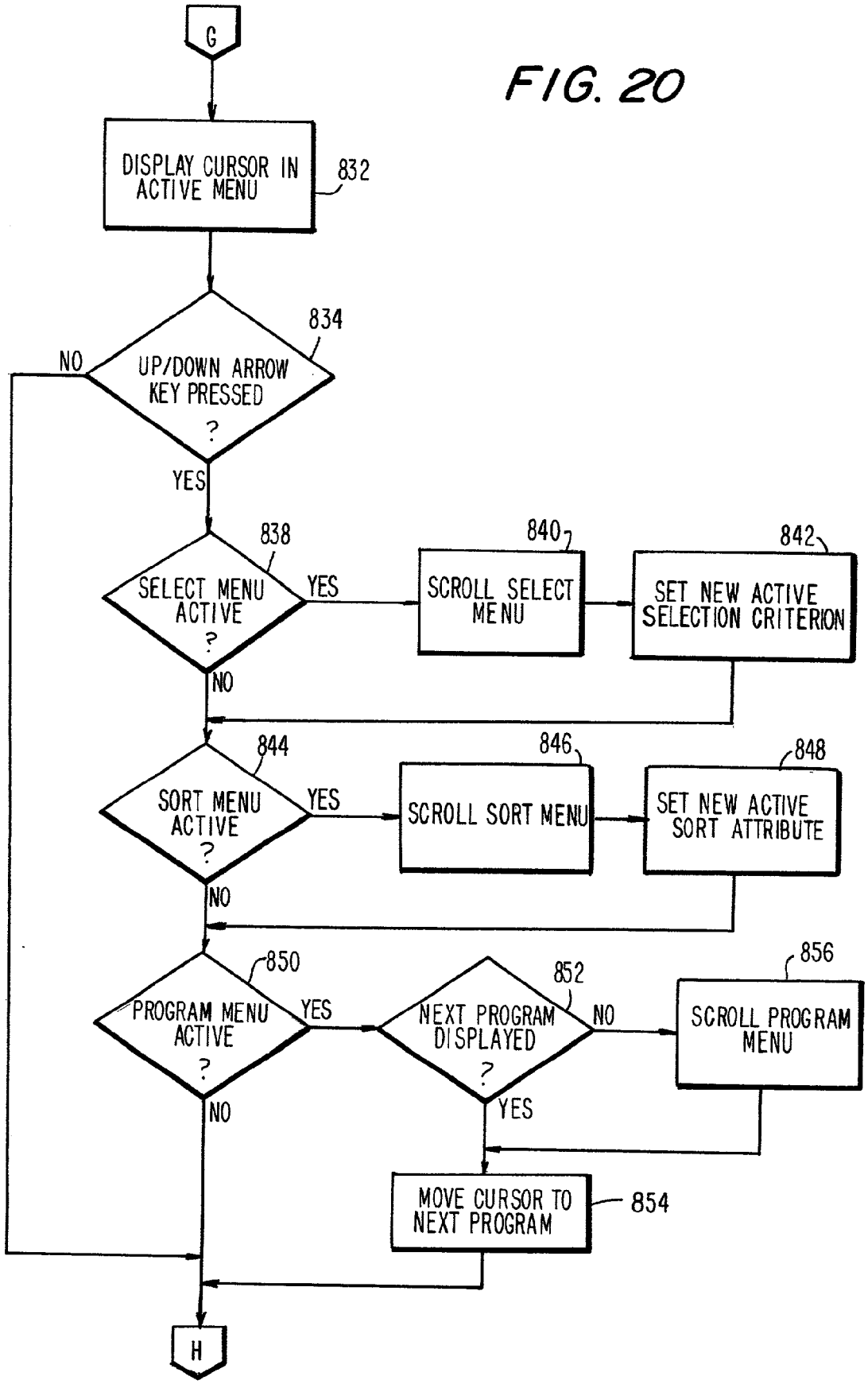
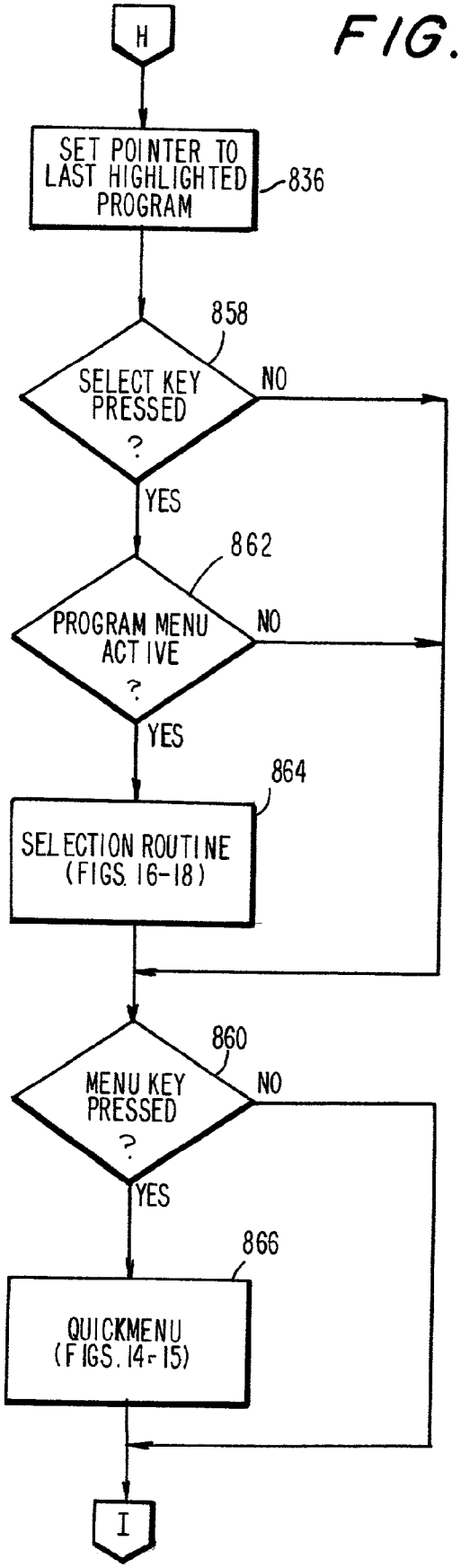

G
DISPLAY CURSOR IN ACTIVE MENU
832
UP/DOWN ARROW KEY PRESSED ?
834
NO
YES
SELECT MENU ACTIVE ?
838
YES
SCROLL SELECT MENU
840
SET NEW ACTIVE SELECTION CRITERION
842
NO
SORT MENU ACTIVE ?
844
YES
SCROLL SORT MENU
846
SET NEW ACTIVE SORT ATTRIBUTE
848
NO
PROGRAM MENU ACTIVE ?
850
YES
NEXT PROGRAM DISPLAYED ?
852
NO
SCROLL PROGRAM MENU
856
NO
YES
MOVE CURSOR TO NEXT PROGRAM
854
H

FIG. 21


H
SET POINTER TO LAST HIGHLIGHTED PROGRAM
836
858
SELECT KEY PRESSED ?
NO
YES
862
PROGRAM MENU ACTIVE ?
NO
YES
864
SELECTION ROUTINE (FIGS. 16-18)
860
MENU KEY PRESSED ?
NO
YES
866
QUICKMENU (FIGS. 14-15)
I

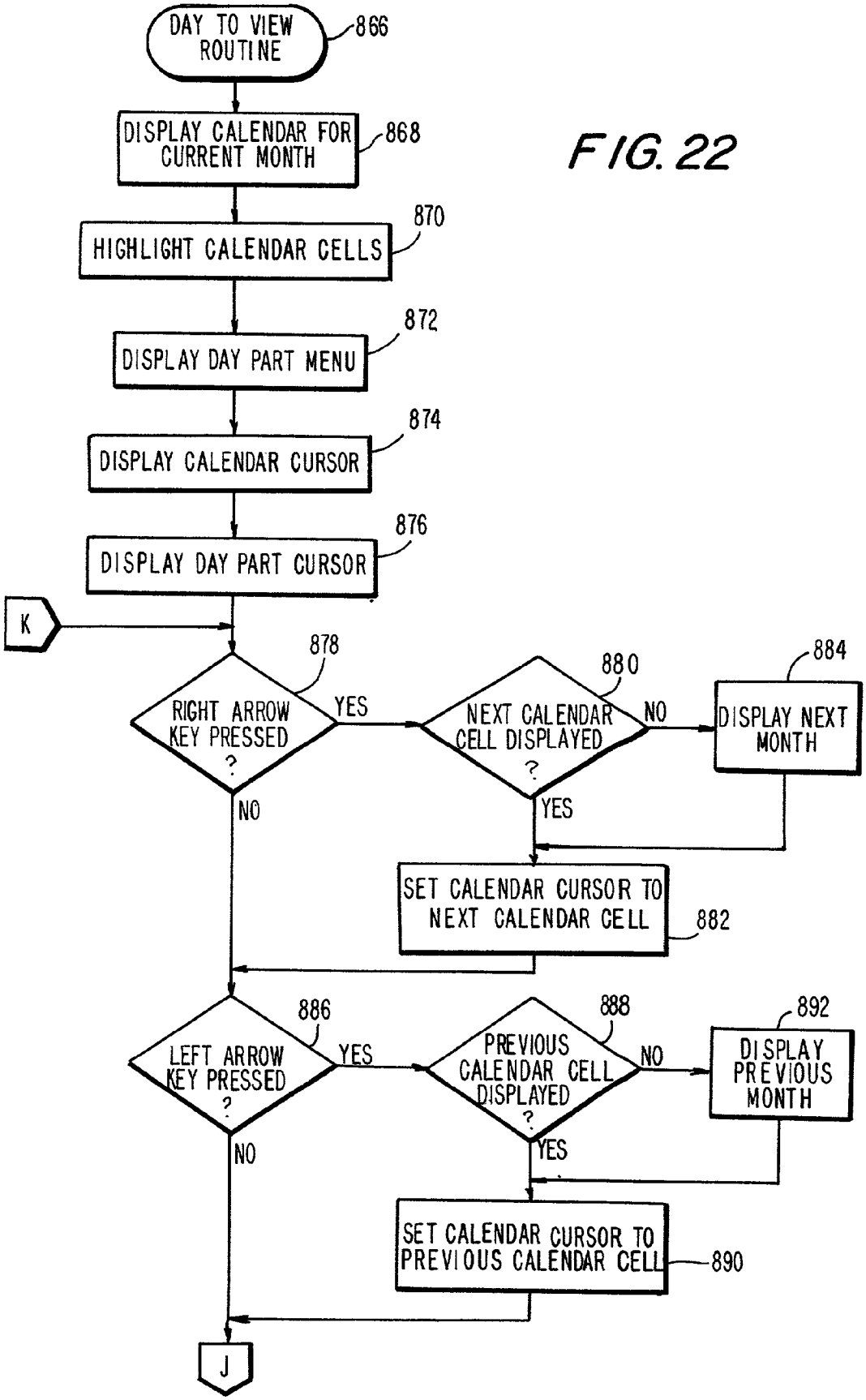
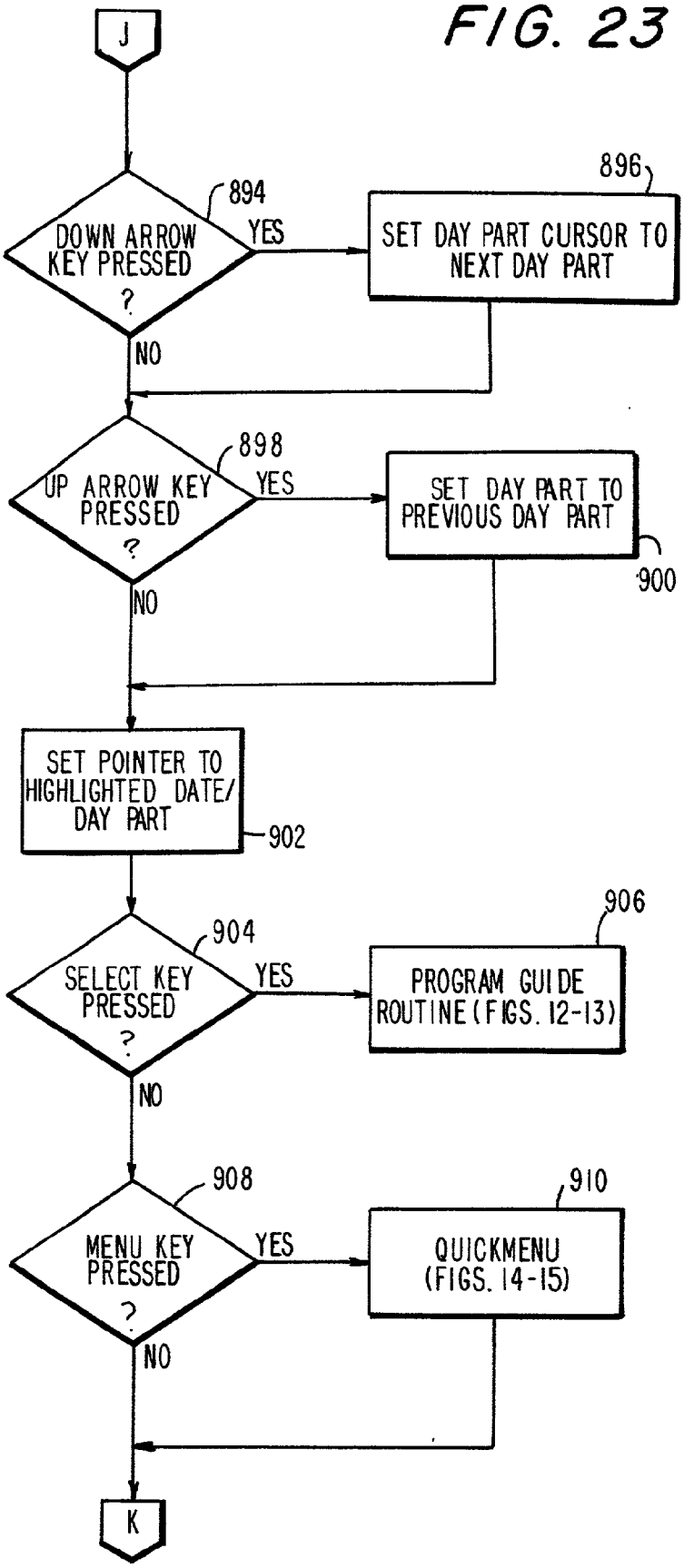

DAY TO VIEW ROUTINE
866
DISPLAY CALENDAR FOR CURRENT MONTH
868
HIGHLIGHT CALENDAR CELLS
870
DISPLAY DAY PART MENU
872
DISPLAY CALENDAR CURSOR
874
DISPLAY DAY PART CURSOR
876
K
RIGHT ARROW KEY PRESSED ?
878
YES
NO
NEXT CALENDAR CELL DISPLAYED ?
880
NO
YES
DISPLAY NEXT MONTH
884
SET CALENDAR CURSOR TO NEXT CALENDAR CELL
882
LEFT ARROW KEY PRESSED ?
886
YES
NO
PREVIOUS CALENDAR CELL DISPLAYED ?
888
NO
YES
DISPLAY PREVIOUS MONTH
892
SET CALENDAR CURSOR TO PREVIOUS CALENDAR CELL
890
J

FIG. 22

FIG. 23


J
894
DOWN ARROW KEY PRESSED ?
YES
896
SET DAY PART CURSOR TO NEXT DAY PART
NO
898
UP ARROW KEY PRESSED ?
YES
SET DAY PART TO PREVIOUS DAY PART
900
NO
SET POINTER TO HIGHLIGHTED DATE/ DAY PART
902
904
SELECT KEY PRESSED ?
YES
906
PROGRAM GUIDE ROUTINE (FIGS. 12-13)
NO
908
MENU KEY PRESSED ?
YES
910
QUICKMENU (FIGS. 14-15)
NO
K

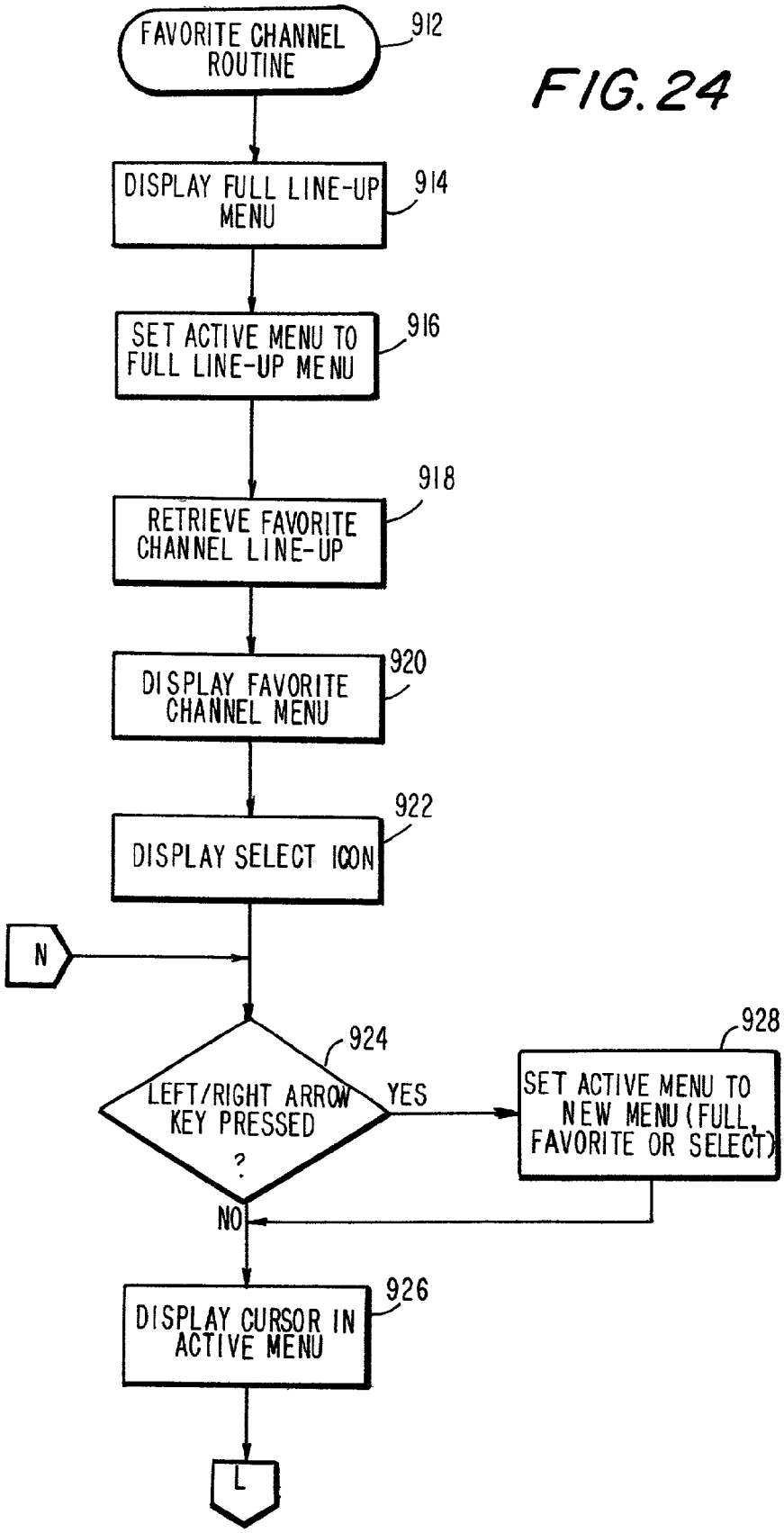

FAVORITE CHANNEL ROUTINE
912
DISPLAY FULL LINE-UP MENU
914
SET ACTIVE MENU TO FULL LINE-UP MENU
916
RETRIEVE FAVORITE CHANNEL LINE-UP
918
DISPLAY FAVORITE CHANNEL MENU
920
DISPLAY SELECT ICON
922
N
LEFT/RIGHT ARROW KEY PRESSED ?
924
YES
SET ACTIVE MENU TO NEW MENU (FULL, FAVORITE OR SELECT)
928
NO
DISPLAY CURSOR IN ACTIVE MENU
926
L

FIG. 24

FIG. 25

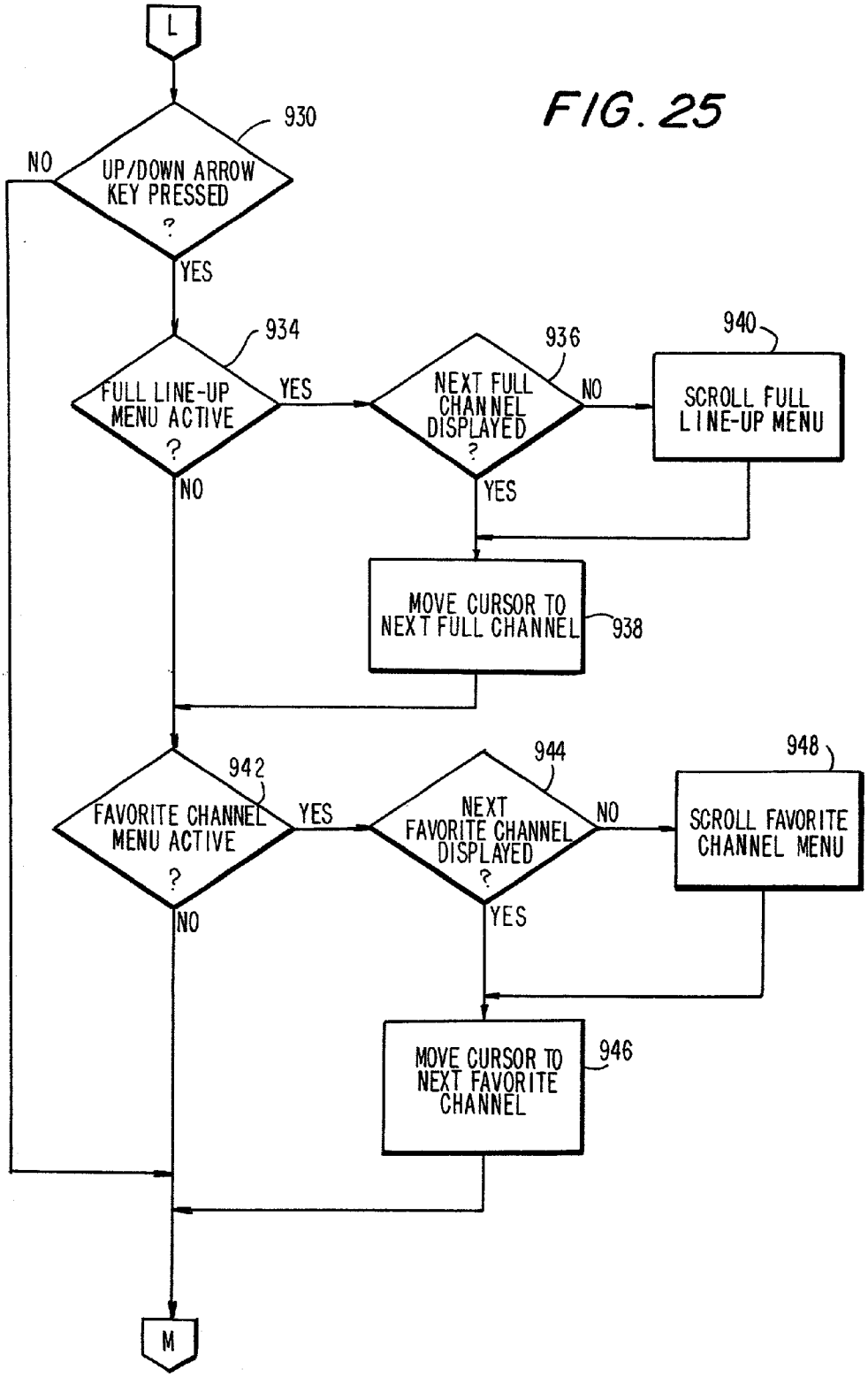

L
930
UP/DOWN ARROW KEY PRESSED ?
NO
YES
934
FULL LINE-UP MENU ACTIVE ?
YES
NO
936
NEXT FULL CHANNEL DISPLAYED ?
NO
YES
940
SCROLL FULL LINE-UP MENU
MOVE CURSOR TO NEXT FULL CHANNEL
938
942
FAVORITE CHANNEL MENU ACTIVE ?
YES
NO
944
NEXT FAVORITE CHANNEL DISPLAYED ?
NO
YES
948
SCROLL FAVORITE CHANNEL MENU
MOVE CURSOR TO NEXT FAVORITE CHANNEL
946
M

FIG. 26

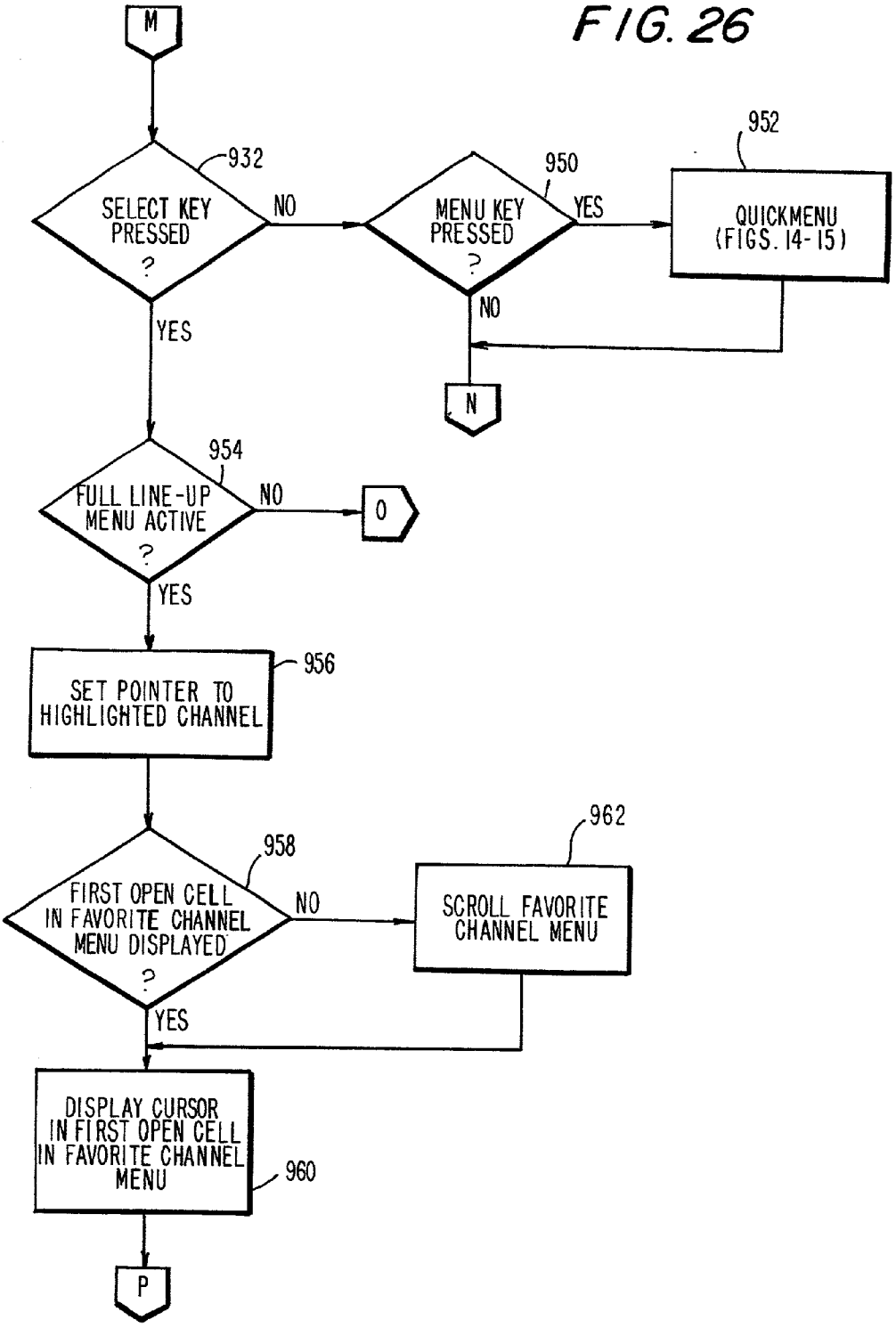

M
932
SELECT KEY PRESSED ?
NO
950
MENU KEY PRESSED ?
YES
952
QUICKMENU (FIGS. 14-15)
NO
N
YES
954
FULL LINE-UP MENU ACTIVE ?
NO
O
YES
956
SET POINTER TO HIGHLIGHTED CHANNEL
958
FIRST OPEN CELL IN FAVORITE CHANNEL MENU DISPLAYED ?
NO
962
SCROLL FAVORITE CHANNEL MENU
YES
DISPLAY CURSOR IN FIRST OPEN CELL IN FAVORITE CHANNEL MENU
960
P

FIG. 27

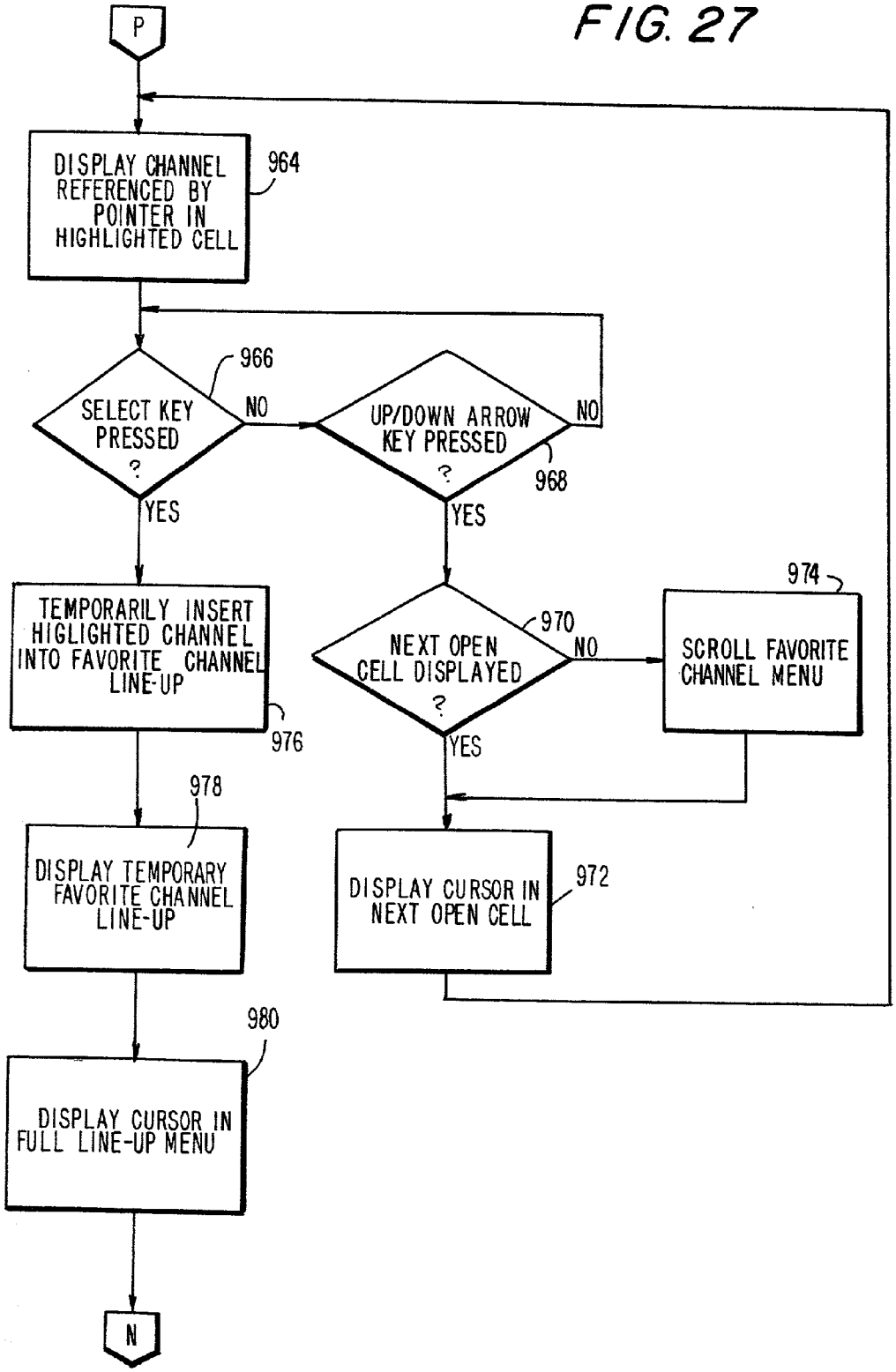
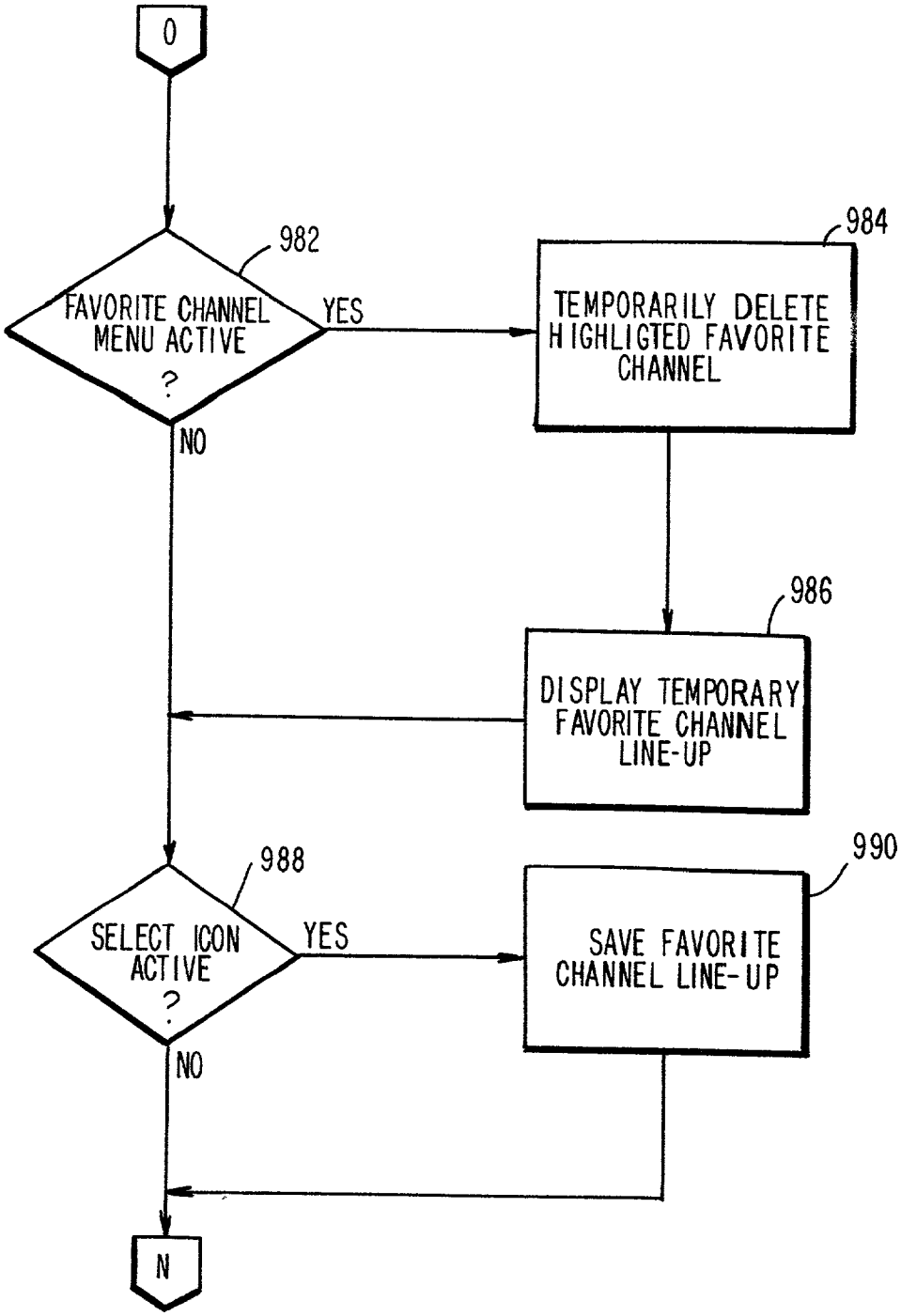

P
DISPLAY CHANNEL REFERENCED BY POINTER IN HIGHLIGHTED CELL
964
966
SELECT KEY PRESSED ?
NO
YES
UP/DOWN ARROW KEY PRESSED ?
NO
YES
968
TEMPORARILY INSERT HIGLIGHTED CHANNEL INTO FAVORITE CHANNEL LINE-UP
976
970
NEXT OPEN CELL DISPLAYED ?
NO
YES
974
SCROLL FAVORITE CHANNEL MENU
978
DISPLAY TEMPORARY FAVORITE CHANNEL LINE-UP
DISPLAY CURSOR IN NEXT OPEN CELL
972
980
DISPLAY CURSOR IN FULL LINE-UP MENU
N

FIG28


O
982
FAVORITE CHANNEL MENU ACTIVE ?
YES
NO
984
TEMPORARILY DELETE HIGHLIGTED FAVORITE CHANNEL
986
DISPLAY TEMPORARY FAVORITE CHANNEL LINE-UP
988
SELECT ICON ACTIVE ?
YES
NO
990
SAVE FAVORITE CHANNEL LINE-UP
N

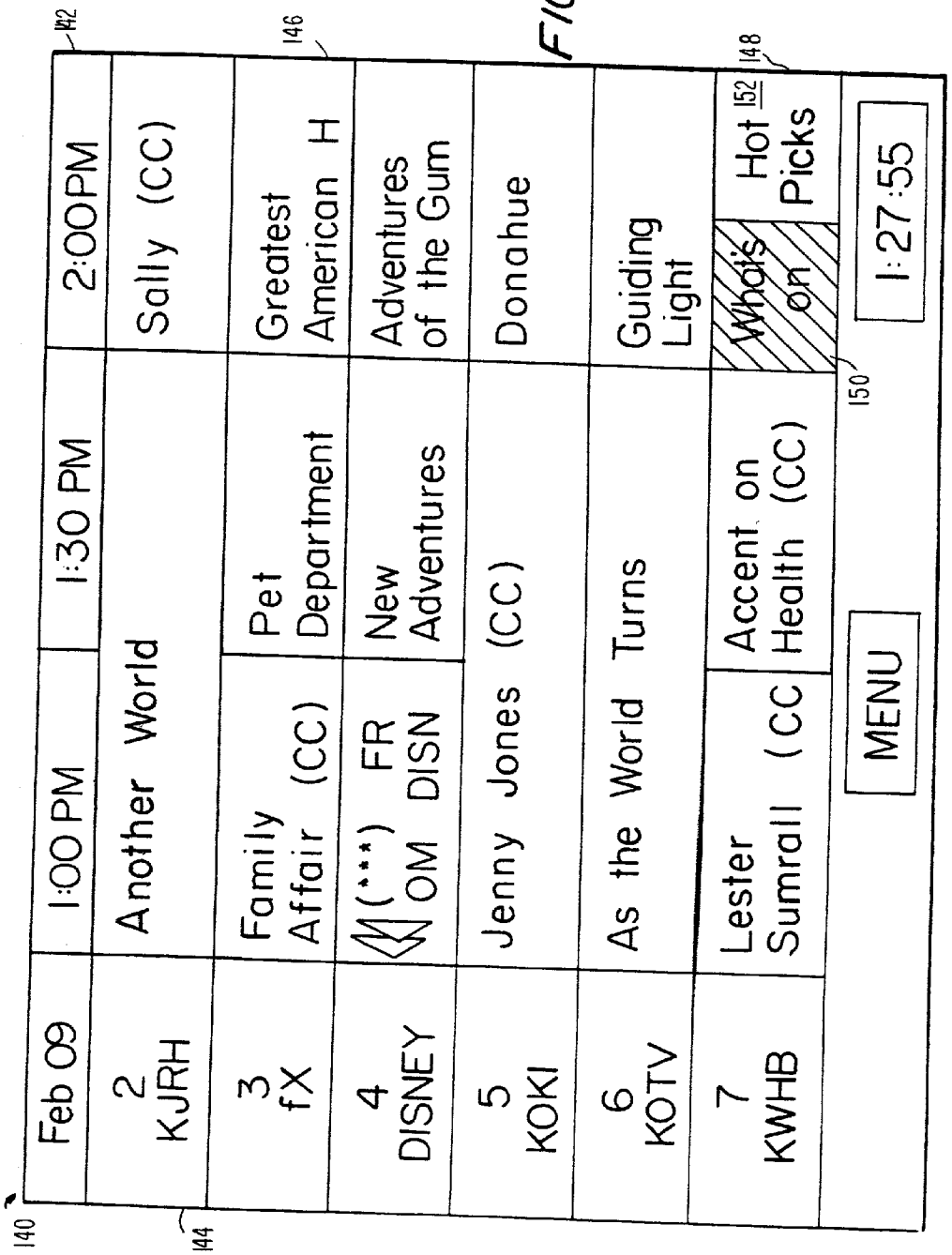

140
142
144
146
148
150
152
Feb 09
1:00 PM
1:30 PM
2:00PM
2 KJRH
Another World
Sally (CC)
3 fX
Family Affair (CC)
Pet Department
Greatest American H
4 DISNEY
(***) FR OM DISN
New Adventures
Adventures of the Gum
5 KOKI
Jenny Jones (CC)
Donahue
6 KOTV
As the World Turns
Guiding Light
7 KWHB
Lester Sumrall (CC
Accent on Health (CC)
Whats on
Hot Picks
MENU
1:27:55

FIG.29

FIG. 30

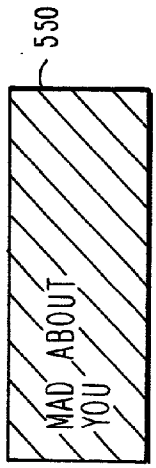


FIG. 32

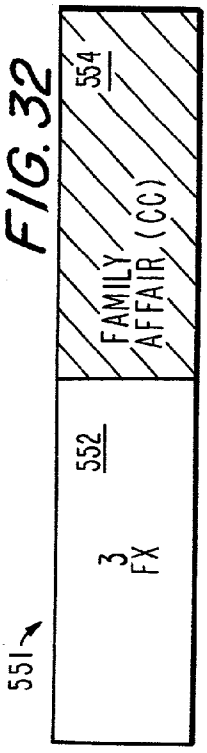


FIG. 31

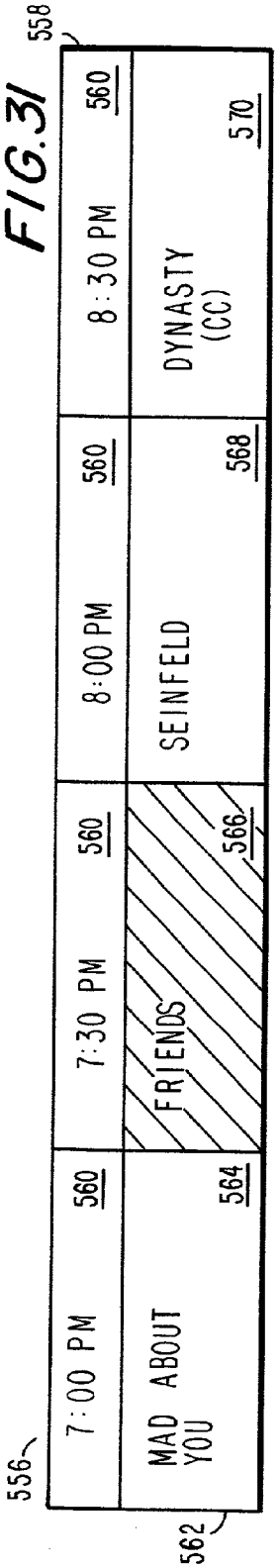
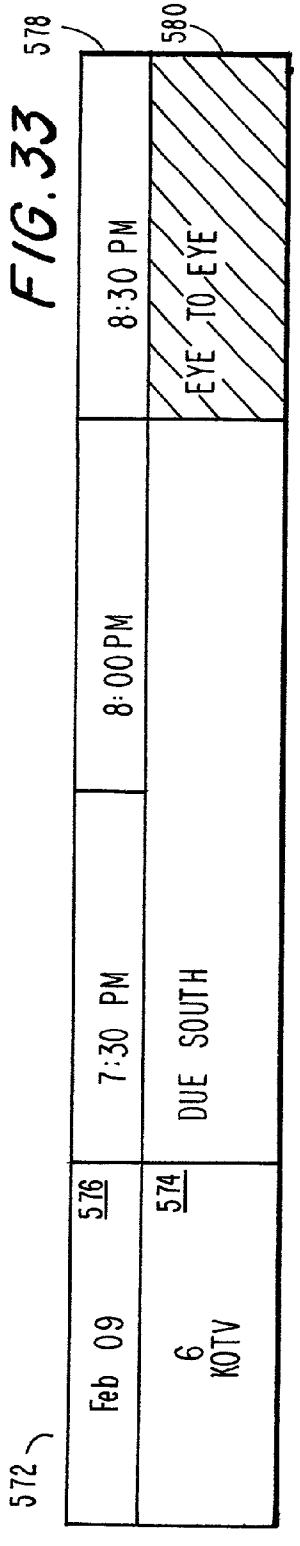


FIG. 33



INTERACTIVE PROGRAM GUIDE SYSTEMS AND PROCESSES

BACKGROUND OF THE INVENTION

[0001] This invention relates to television program guide systems and particularly to interactive television program guide systems and related processes that can automatically tune a television, or program a video cassette recorder (VCR), based on program selections made from program schedule information displayed on a television or other suitable video monitor. More particularly, this invention relates to interactive television program guide systems and related processes that provide an intuitive search utility for allowing a viewer to locate programs of interest by applying a restrictive search selection criterion and a nonrestrictive sort attribute to program schedule information.

[0002] In response to viewer demand, cable and satellite telecasting services have been improving programming variety, mainly by increasing the number of program channels available to their customers. For example, many cable telecasting services now offer several dozen program channels, and it is expected that this number will steadily increase as more cable services replace their coaxial cable networks with fiber optic networks. It is expected that satellite telecasting services also will continue to improve programming variety by increasing the number of program channels available to their customers.

[0003] Needless to say, improved programming variety is welcomed by the viewing public, but it does not come without cost. One problem frequently encountered by viewers is that the increased number of channels has made it difficult to quickly locate and tune to programs of interest. Before cable television became popular, it was common practice for viewers to briefly sample the program being broadcast on each of the few aerial broadcast channels that were available in order to select a program to watch. However, this technique, known as "channel surfing," is difficult to do when one has to consider programs on several dozen channels, and it is possible that in doing so, a viewer will miss an undesirably large segment of the program ultimately selected for viewing.

[0004] Another concern is that the increased number of channels makes it more likely that two programs of interest will be telecast at any given time. Viewers therefore often find it necessary to record one program for later viewing while another program of interest is being watched. Thus, as the number of channels provided by telecasting services increases, the need for a system and process that simplifies the notoriously difficult task of scheduling programs for VCR recording becomes more pressing.

[0005] Over the past several years, television viewers have grown accustomed to a scrolling television program guide that is offered by many telecasting services in the United States. One such guide, known as the Prevue Channel, presents to the viewer (on a channel selected by the telecasting service), a scrolling grid containing program schedule information for each channel offered by that telecasting service. The horizontal axis of the scrolling grid identifies program schedule times, and the vertical axis identifies program channels. Typically, one and a half hours of program schedule information are provided, starting at a current time period (typically one half hour).

[0006] The grid format used by the Prevue Channel for presenting program schedule information has been favorably received by the viewing public. Essentially, the body of the grid contains an array of cells, each cell representing a program being telecast or to be telecast on the channel identified on the vertical axis, during the time periods specified on the horizontal axis. The size of each cell (i.e., the cell width) represents the length of the program (spanning one or more time periods).

[0007] Although the scrolling grid program guide has proven valuable to viewers over the past several years, it is not an interactive program guide, and therefore, it lacks certain capabilities that viewers would find very useful. For example, the scrolling grid does not have the ability to present program schedule information for telecast times beyond a relatively short period from the current time (e.g., one and a half hours). Also, the grid scrolls at a pace that the viewer cannot control. Thus, it may take several minutes for the scrolling grid to advance to program schedule information that the viewer wishes to consider. Finally, the viewer cannot directly use the scrolling grid for tuning a television to a desired channel or programming a VCR.

[0008] Attempts have been made to provide interactive program guides with such capabilities. One system is described in U.S. Pat. No. 4,706,121; however, for several reasons, the system described therein has disadvantages. For instance, the system described in U.S. Pat. No. 4,706,121 allows a viewer to choose a plurality of user program selection criteria which are combined to present a list of programs meeting the combined criteria. This operates to restrict the display of program schedule information only to those programs that meet the combined user program selection criteria. When the selection criteria are activated, the viewer is unable to select for viewing or recording any program that does not meet the selection criteria because such programs would not be listed. In order to select such a program, the viewer must either deactivate the selection criteria, or try a different combination of criteria (or perhaps a single criterion) in order to capture a program of interest within the program list.

[0009] Moreover, the approach taken in U.S. Pat. No. 4,706,121 of combining user program selection criteria may often lead to an undesirably restricted program listing. In fact, it is possible that no programs at all will be displayed in a list because none meets the overly restrictive combination of user program selection criteria. If the viewer then turns the selection criteria selection off, the entire schedule is made available to the viewer, but in an order defined by the telecasting service (e.g., typically by telecast time and channel). The viewer is not provided with the ability to sort, without restricting, either the full program listing or a restricted program listing in a meaningful way.

[0010] Thus, it would be desirable to provide interactive program guide systems and related processes that allow a viewer to apply a nonrestrictive sort attribute to program schedule information in addition to, or as an alternative to, a restrictive selection criterion.

[0011] It would also be desirable to provide interactive program guide systems and related processes in which the telecasting service can define sets of nonrestrictive sort attributes and restrictive selection criteria that the viewer can apply to the program schedule information.

[0012] It would further be desirable to provide interactive program guide systems and related processes in which the telecasting service can define different sets of nonrestrictive sort attributes for the viewer to choose from depending upon a restrictive selection criterion applied to the program schedule information by the viewer.

[0013] It is important that interactive program guides be capable of presenting several days worth of program schedule information so that the viewer can schedule VCR recording of selected programs well in advance of their telecast times. However, existing interactive program guides do not provide a convenient interface that allows the viewer to quickly select program schedule information for a particular date.

[0014] Thus, it would be desirable to provide interactive program guide systems and related processes that provide a graphical user interface for displaying the dates for which program schedule information is available, and for allowing the user to select program schedule information for a particular date.

[0015] In order to provide viewers with a full-featured interactive program guide, it is typically necessary to use several different screens, each screen being associated with one or more features of the system. However, it has been determined that viewers often find themselves lost in such systems, without a clear understanding of how to return a particular screen of interest in the system.

[0016] Thus, it would be desirable to provide interactive program guide systems and related processes that include a menu that may be invoked by the viewer from any screen of the interactive program guide, where the menu is used by the viewer to navigate through the various screens of the interactive program guide.

[0017] It would also be desirable to provide interactive program guide systems and related processes in which the telecasting service could define the available menu choices.

SUMMARY OF THE INVENTION

[0018] It is an object of this invention to provide interactive program guide systems and related processes that allow a viewer to apply a nonrestrictive sort attribute to program schedule information in addition to, or as an alternative to, a restrictive selection criterion.

[0019] It is also an object of this invention to provide interactive program guide systems and related processes in which the telecasting service can define nonrestrictive sort attributes and restrictive selection criteria that the viewer can apply to the program schedule information.

[0020] It is another object of this invention to provide interactive program guide systems and related processes in which the telecasting service can define different sets of nonrestrictive sort attributes for the viewer to choose from depending upon a restrictive selection criterion applied to the program schedule information by the viewer.

[0021] It is a further object of this invention to provide interactive program guide systems and related processes that contemporaneously display, on a single screen, the nonrestrictive sort attributes and restrictive selection criteria available for the viewer to choose from, along with the program schedule information that meets the restrictive selection criterion chosen by the viewer in the sort order defined by the selected sort attribute.

[0022] It is even a further object of this invention to provide interactive program guide systems and related processes that provide a graphical user interface for displaying the dates for which program schedule information is available, and for allowing the user to select program schedule information for a particular date.

[0023] It is still a further object of this invention to provide interactive program guide systems and related processes that include a menu that may be invoked by the viewer from any screen of the interactive program guide, where the menu is used by the viewer to navigate through the various screens of the interactive program guide.

[0024] It is yet a further object of this invention to provide interactive program guide systems and related processes in which the telecasting service can define the available menu choices.

[0025] In accordance with this invention, interactive program guide systems and related processes are provided which can automatically tune a television, or program a VCR, based on program selections made from program schedule information displayed on a television or other suitable video monitor. The interactive program guide is implemented preferably using a microprocessor-controlled set-top box that is coupled to the viewer's television set. The set-top box receives program schedule information and software from a headend telecasting center. Preferably, program schedule information for the current day and at least six subsequent days is stored in a memory within the set-top box. The program schedule information used in connection with the present invention may be generic, in the sense that the data comprising the program schedule information may be used for other purposes, such as by other set-top boxes having capabilities different from or additional to those described above. Preferably, the program schedule information includes program titles, telecast times, channels, program descriptions, and other useful information.

[0026] The interactive program guide of the present invention operates in several different viewer-selectable display modes in order to present to, and acquire information from, a viewer. The primary display mode is the Program Guide display mode. In this mode, the interactive program guide presents program schedule information in a familiar grid format. The viewer can use navigation keys on a remote control to move a cursor to a desired program. Once a program of interest has been located and highlighted by the cursor, the viewer can use the remote control to cause the set-top box to tune to the selected program ("point and tune"), or to schedule the program for later viewing or recording (if not yet being telecast).

[0027] The interactive program guide of the present invention also provides a Program Search display mode. The Program Search display mode may be used by the viewer to search a list of program schedule information for programs desired to be viewed or recorded, using a restrictive search selection criterion and a nonrestrictive sort attribute to the program schedule information. The interactive program guide advantageously provides a contemporaneous display of the available selection criteria and sort attributes, and the

results obtained by applying a selection criterion and/or sort attribute to the program schedule information. Preferably, the selection criteria and sort attributes are defined by the headend telecasting center, and they are transferred to the set-top box as operational parameters along with the software used to implement the interactive program guide. The headend telecasting center may also define a default selection criterion and a default sort attribute which are automatically applied to the program schedule information when the Program Search display mode is invoked. Moreover, the nonrestrictive sort attributes available to the viewer may be a function of the particular restrictive user program selection criterion previously selected by the viewer.

[0028] The interactive program guide of the present invention also includes two display modes that facilitate viewer navigation in the Program Search display mode. The first, referred to as the Day to View display mode, is used to navigate the Program Guide display mode to program schedule information for a particular date, and even more specifically to a particular range of hours (i.e., "day part") for that selected date. The second, referred to as the Favorite Channel display mode, allows the viewer to define a favorite channel line-up. After the viewer establishes a favorite channel line-up, the program schedule information displayed in the Program Guide display mode is sorted in accordance with the channels selected by the viewer. The favorite channel line-up is preferably nonrestrictive. That is, the channels selected by the viewer are moved to the beginning of the program guide in the sequence selected by the viewer, with the other channels following thereafter. The viewer's favorite channel line-up is preferably not applied in the Program Search display mode.

[0029] The interactive program guide of the present invention also provides a convenient menu (referred to herein as a "quickmenu") that the viewer can invoke from any of the above-described display modes. The quickmenu includes menu choices that allow the viewer to quickly switch from one of the above-described display modes to another. In addition to the display mode choices, the quickmenu also includes menu choices that operate as short-cut navigation tools in the Program Guide display mode. For example, the viewer can select a quickmenu choice that causes the interactive program guide to automatically navigate the program grid to programs scheduled for telecast during prime time (e.g., starting at 7:00 PM) irrespective of the current time. The quickmenu may also include context sensitive menu choices which are defined in accordance with the display mode from which the quickmenu is invoked. The available quickmenu choices, including default menu choices (i.e., the choices displayed when the quickmenu is invoked) are preferably defined by the headend telecasting center and transmitted to the set-top box as operational parameters.

BRIEF DESCRIPTION OF THE DRAWINGS

[0030] The above and other objects and advantages of the present invention will be apparent upon consideration of the following detailed description, taken in conjunction with the accompanying drawings, in which like reference characters refer to like parts throughout, and in which:

[0031] **FIG. 1** is a block diagram of a telecasting system which may provide the interactive program guide of the present invention;

[0032] **FIG. 2** is a block diagram of a set-top box suitable for implementing the interactive program guide of the present invention;

[0033] FIGS. **3-10** are sample screen displays which illustrate the operation of the interactive program guide of the present invention;

[0034] FIGS. **11-28** are logic flow diagrams representing, at a functional level, a control program used to implement the interactive program guide of the present invention.

[0035] **FIG. 29** is a sample screen display which illustrates the operation of an alternative embodiment of the interactive program guide of the present invention; and

[0036] FIGS. **30-33** are sample screen displays which illustrate the operation of an abbreviated program guide provided in accordance with the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0037] Referring first to **FIG. 1, a** system **50** which provides the interactive program guide of the present invention is described. It should be understood, however, that although the invention is described in the context of a conventional cable telecasting system, the principles described herein also apply to satellite telecasting systems, as well as other systems that are suitable for providing television services to viewers.

[0038] The system **50** includes a data center **52** and a headend telecasting center **54**. The data center **52** includes a central computer system **56** for updating and storing program schedule information. The program schedule information maintained by the central computer system **56** is "complete" in the sense that it includes data to be used by all telecasting services that provides the interactive program guide of the present invention. The data are also generic, in the sense that they may be used by other systems not implementing the present invention. The program schedule information may be supplied to the central computer system **56** through manual data entry (e.g., a keyboard) or it may be provided from outside sources via magnetic media (e.g., tape or disk), modem link or any other suitable data transfer mechanism. Program schedule information includes at least program channels, titles, and telecast times and may include also program descriptions, telecast call signs, themes, and other information that may be used to classify programs into one or more categories.

[0039] Using a satellite transmitter **58**, the data center **52** transmits the program schedule information to the headend telecasting center **54** via a satellite **60**. The program schedule information is received by a satellite receiver **62**, which in turn transfers the data to a headend computer **64**. Preferably, the data center **52** provides a continuous feed of program schedule information to the headend telecasting center **54**, so that the headend telecasting center can quickly recover from any unexpected loss of data. The continuous feed also ensures that the headend telecasting center **62** is provided with any updates to the program schedule information soon after they are made. The data center **52** preferably provides program schedule information to the headend telecasting center **54** for the current day and at least six additional days following the current day.

[0040] As mentioned above, the data center **52** transmits program schedule information for all telecasting services that provide the interactive program guide of the present invention. However, cable operators likely will not want viewers to see program schedule information for channels that they do not receive. Therefore, one function performed by the headend computer **64** is selection of program schedule information for only those channels that are offered by the headend telecasting center **54**.

[0041] The "reduced" set of program schedule information is supplied to a set-top computer **66**. The set-top computer **66** formats the program schedule information for transmission on a cable network **68** along with television program signals on a plurality of channels. (The formatted data also are generic, in the sense that a set-top box not implementing the present invention could use the formatted data for other purposes.) A plurality of set-top boxes **70** coupled to the cable network **68** receive the television program signals and the program schedule information.

[0042] Any conventional method of transmitting the program schedule information with the television program signals may be used in connection with the present invention. Preferably, an out-of-band channel (e.g., channel 0) is used to provide a continuous feed transmission of the program schedule information on the cable network **68**. The continuous feed transmission of the program schedule information allows for quick restoration of the interactive program guide in the event a set-top box **70** experiences a power interruption. It also provides for prompt updating of schedule information in the event schedule changes are made at the data center **52**. Alternatively, the program schedule information may be transmitted using the vertical blanking interval (VBI) of one, some or all of the program channels provided by the headend telecasting center.

[0043] In addition to the program schedule information, the headend telecasting center **54** may also transmit software modules and operational parameters used by the set-top boxes **70** to implement the interactive program guide of the present invention. Furthermore, the software modules and operational parameters may originate from the data center **52** rather than the headend telecasting center **54**. The operational parameters may include, for example, nonrestrictive sort attributes, restrictive selection criteria, menu choices, and default menu selections (all of which are described in greater detail below).

[0044] Turning now to **FIG. 2, a** set-top box **70** suitable for implementing the interactive program guide of the present invention is described. Television signals, program schedule information, operational parameters, and software modules transmitted on the cable network **68** are first received by tuning circuitry **72**. The tuning circuitry **72** processes the incoming signals in a conventional manner to extract the program schedule information, operational parameters, and software modules. The program schedule information, operational parameters, and software modules are provided to a control unit **74**, which is preferably microprocessor-based. The control unit **74** stores the program schedule information, operational parameters, and software modules in a memory **76**. The memory **76** is preferably random access memory (RAM), but it may also include read only memory (ROM) or flash memory to provide the control unit **74** with the instructions necessary to perform the initial loading of program schedule information, operational parameters, and software modules into the memory **76** when the set-top box **70** is turned on. After the memory **76** is loaded, it preferably contains program schedule information for the current day and at least six subsequent days.

[0045] In addition to directing the program schedule information, operational parameters and software modules to the control unit **74**, the tuning circuitry **72** also tunes the set-top box **70** to a program channel selected by the viewer. The viewer can make channel selections by using a remote control **78** that communicates with the control unit **74** through an infrared receiver **80**. Upon receiving the viewer's channel selection, the control unit **74** causes the tuning circuitry **72** to tune to the selected channel. The television signals on the selected channel are received by generator synch lock ("genlock") circuitry **82**. When the interactive program guide is not on, the television signals on the selected channel pass through the genlock circuitry **82** and are received by a display **84**, which is preferably a conventional television set. The display **84** displays the television program on the selected channel.

[0046] The remote control **78** may also be used by the viewer to invoke the interactive program guide of the present invention. When the control unit **74** receives the appropriate command, it retrieves at least a portion of the program schedule information from the memory **76**. The control unit **74** provides the retrieved data to digital video circuitry **86** which converts the digital data to video signals. The interactive program guide video signals are then provided to the genlock circuitry **82** which synchronizes those signals to the television signals received from the tuning circuitry **72**. The interactive program guide appears as an overlay on the television program that was being displayed on the display **84**. As the viewer uses the remote control **78** to navigate in the interactive program guide, the appropriate program schedule information is retrieved from the memory **76** by the control unit **74**, and ultimately displayed on the display **84**. When the viewer deselects the interactive program guide, the control unit **74** stops providing data to the digital video circuitry **86**, and the interactive program guide disappears.

[0047] The interactive program guide can be used by the viewer to select programs of interest for display on the display **84**. The interactive program guide may also be used to program a video cassette recorder (VCR) **88**. The control unit **74** preferably exerts control over the VCR **88** through the use of an infrared transmitter **90** which communicates with an infrared receiver (not shown) of the VCR **88**. Control preferably includes starting and stopping recording by the VCR **88**, and it may also include channel selection as well as other more advanced control commands.

[0048] In **FIG. 2**, the display **84** and the VCR **88** are shown connected to the genlock circuitry **82**. Other arrangements are possible. For example, the VCR can be connected to the genlock circuitry **82** and the display **84** can be connected to the VCR. However, if the viewer wishes to record and view different programs at the same time, the VCR **88** can be connected directly to the cable network **68**. The invention also contemplates the use of a set-top box (not shown) that includes two tuners—one each for the VCR **88** and the display **84**.

[0049] In many respects the remote control **78** used with the set-top box **70** may be conventional. For example, the remote control **78** may include a series keys numbered 0 through 9 which may be used by the viewer to cause the tuning circuitry **72** to tune to a particular channel. Preferably, the remote control **78** includes the following nine additional keys for use in connection with the interactive program guide:

Remote Control Keys	
Guide	Left Arrow
Menu	Right Arrow
Select	Page Forward
Up Arrow	Page Backward
Down Arrow	

[0050] The interactive program guide of the present invention preferably uses several different display modes in order to present and acquire information from the viewer. When the viewer presses the Guide key on the remote control **78**, the interactive program initially enters a "Program Guide" display mode.

[0051] **FIG. 3** depicts a program guide screen **100** that is presented on the display **84** when the Program Guide mode is initially invoked (i.e., by pressing the Guide key on the remote control **78**). The program guide screen **100** adopts the familiar grid format for presenting program schedule information to viewers. The screen **100** includes a time bar **102** that is divided into a plurality of horizontally arranged time cells **104** and a date cell **106**. Each time cell **104** corresponds to a one half hour time period of television programming. The date cell **106** identifies the telecast date for the displayed program schedule information.

[0052] The screen **100** also includes a channel bar **108** that is divided into a plurality of vertically arranged channel cells **110**. The channel cells **110** identify the channels on which the displayed programs are to be (or are being) telecast.

[0053] The screen **100** further includes a program grid **112**. Essentially, the program grid **112** displays at any given time, a subset of the program schedule information stored in the memory **76** (**FIG. 2**). The program grid **112** is divided into a plurality of program cells **114**. Each program cell **114** contains information pertaining to a particular television program. In the preferred embodiment, this information always includes the program title, but as shown, the information for any particular program may also include release year, MPAA rating (for movies), theme, etc. The length of each program cell **114** corresponds to the length of the program named therein, and may span more than one time period. Thus, the viewer can easily determine the start time, stop time and length of each program by simply comparing the boundaries of the particular program cell **114** of interest to the time bar **102**.

[0054] When the Program Guide display mode is initially invoked by pressing the Guide key on the remote control **78** (**FIG. 2**), the screen **100** also includes a menu overlay or "quickmenu"**116**. The quickmenu **116** can also be invoked from any display mode of the interactive program guide by pressing the Menu key on the remote control **78** (**FIG. 2**). The quickmenu **116** contains a plurality of menu choices which allow the viewer to control the operation of the interactive program guide. Only three menu choices are displayed at any given time—one in each of a current choice cell **118**, a previous choice cell **120**, and a next choice cell **122**.

[0055] The viewer uses the Left and Right Arrow keys on the remote control **78** (**FIG. 2**) to navigate in the quickmenu **116**. Pressing the Left Arrow key moves the menu choice previously contained in the next choice cell **122** to the current choice cell **118**. Pressing the Right Arrow key moves the menu choice previously contained in the previous choice cell **120** to the current choice cell **118**. In this manner, the viewer can scroll through the various menu choices until the desired menu choice is located. The quickmenu **116** preferably operates in an endless-loop fashion. When the desired menu choice appears in the current choice cell **118**, the viewer presses the Select key to activate the choice.

[0056] There are two ways to remove the quickmenu **116** from the screen **100** (or from any other screen that the quickmenu **116** is displayed on). The Menu key on the remote control **78** (**FIG. 1**) acts as a toggle, so that when the quickmenu **116** is displayed, the Menu key having first been pressed, pressing the Menu key again removes it. The viewer can also clear the quickmenu **116** by pressing the Up Arrow key. When the quickmenu **116** is cleared, the viewer can navigate in the underlying screen as appropriate for the current display mode.

[0057] Below the quickmenu **116** is a title bar **124**. The title bar **124** includes a clock cell **126** which displays the current time. The title bar **124** also contains context sensitive information. For example, when the quickmenu **116** is displayed, the title bar **124** contains simple yet intuitive instructions on how to use the quickmenu **116**.

[0058] The menu choices available in the quickmenu **116** can be broadly categorized into two groups. The first group of choices provides the viewer with shortcuts for navigating in the Program Guide display mode. In the preferred embodiment, there are three shortcut choices or "navigation points" referred to as "Hot Picks,""What's On" and "Prime Time."Selection of a navigation point from the quickmenu **116** simply results in a change in the data displayed in the screen **100** without changing the display mode (i.e., the display mode remains Program Guide). The second group of choices are used by the viewer to select from among the plurality of display modes used in the interactive program guide. In the preferred embodiment, the display mode choices are "Program Guide,""Program Search,""Day To View" and "Favorite Channel."

[0059] Referring now to **FIG. 4**, the program guide screen **100** is shown as it may appear when the Hot Picks navigation point is selected. It should also be noted that the Hot Picks navigation point is automatically selected by the control unit **74** (**FIG. 2**) when the viewer invokes the interactive program guide by pressing the Guide key on the remote control **78** (**FIG. 2**). With the quickmenu **116** (**FIG. 3**) not displayed, the title bar **124** informs the viewer that the quickmenu **116** (**FIG. 3**) can be invoked by pressing the Menu key.

[0060] As shown in **FIG. 4**, selection of the Hot Picks navigation point causes the interactive program guide to present a "premium channel line-up." The premium channel

line-up includes program schedule information for programs available on premium channels during prime time (e.g., starting at 7:00 PM) on the current date (and not dependent on either the current time period or the current channel to which the tuning circuitry **72** (**FIG. 2**) is tuned). Preferably, the premium channel line-up fits in one screen (i.e., the viewer does not need to scroll the program grid **112** in order to see program schedule information for additional premium channels). The designation of particular channels as "premium channels" is preferably accomplished through the use of operational parameters stored in the memory **76** (**FIG. 2**). The premium channel designations may be made at the headend telecasting center **54** (**FIG. 1**) in order to provide a consolidated presentation of program schedule information that may be of local interest.

[**0061**] A program cell **127** is shown highlighted in **FIG. 4** to indicate the location of a cursor in the program grid **112**. The viewer can navigate in the program grid **112** (i.e., move the cursor) by using the Left, Right, Up, and Down Arrow keys on the remote control **78** (**FIG. 2**) in a conventional manner. For example, if the Right Arrow key is pressed while the program cell **127** is highlighted, the cursor moves to a program cell **128**. The program cell **128** is then highlighted whereas the program cell **127** is no longer highlighted. If the Down Arrow key is pressed while either of the program cells **127** or **128** is highlighted, the cursor moves to a program cell **130**.

[**0062**] The program grid **112**, the time bar **102**, and the channel bar **108** scroll as needed when the viewer attempts to move the cursor beyond the displayed program schedule information. For example, if the viewer presses the Left Arrow key while the program cell **127** is highlighted, the program grid **112** and the time bar **102** will scroll sufficiently far to the right to allow the display of program schedule information for the program scheduled for telecast immediately prior to the one indicated by the program cell **127**. Continuation icons **132** indicate that particular programs start before or finish later than the times currently displayed in the time bar **102**. The viewer can see when such programs start or end by scrolling the program grid **112** using the arrow keys corresponding to the directions indicated by the continuation icons **128**.

[**0063**] From the viewer's perspective, the interactive program guide operates as though the premium channel line-up is prepended to a "main channel line-up" comprising schedule information for other available channels. In addition, program schedule information is preferably displayed in an endless loop fashion. By default, the main channel line-up comprises program schedule information for all available channels (including the designated premium channels) arranged sequentially by channel number. Thus, if the viewer presses the Down Arrow key while a program cell **134** is highlighted, the program grid **112** and the channel bar **108** advance such that program schedule information for the first channel in the main channel line-up (e.g., channel 2) appears in the last row of the program grid **112**. On the other hand, if the Up Arrow key is pressed while the program cell **127** is highlighted, program schedule information for the last channel in the main channel line-up appears in the first row of the program grid **112**. If the viewer then chooses to scroll through the entire main channel line-up, program schedule information for the premium channel line-up reappears in the program grid **112**. It should be noted, however, that the present invention allows for viewer modification of the main channel line-up (by sorting) through the use of the Favorite Channel display mode (described below in connection with **FIG. 9**.)

[**0064**] The Page Forward and Page Backward keys are also used for navigating in the Program Guide display mode. (The Left Arrow, Right Arrow, Up Arrow, Down Arrow, Page Forward and Page Backward Keys are collectively referred to as "navigation keys.") For example, if the Page Forward key is pressed while the premium channel line-up is displayed, the program grid **112** and the channel bar **108** scroll such that the premium channel line-up is replaced with program schedule information for the first six channels in the sequential channel line-up. If the Page Backward key is pressed instead, the program schedule information for the last six channels in the sequential channel line-up is displayed.

[**0065**] The Select key on the remote control **78** (**FIG. 2**) is used by a viewer to select a highlighted program. After a program has been selected, the viewer can choose to tune to the selected program, record the selected program, or simply see more information about the selected program. These features are described in greater detail below in connection with **FIG. 10**.

[**0066**] **FIG. 5** depicts the program guide screen **100** as it appears when the viewer selects the Prime Time navigation point from the quickmenu **116** (**FIG. 3**). Prime time program schedule information for the date shown in the date cell **106** is displayed for the main channel line-up, starting with the first channel (e.g., channel **2**). The hours constituting "Prime Time" are defined by operational parameters stored in the memory **76** (**FIG. 2**); therefore, they may be set by either the data center **52** (**FIG. 1**) or the headend telecasting center **54** (**FIG. 1**). The display starts at the beginning of prime time and at the lowest channel (without regard to the current time period or the channel to which the tuning circuitry **72** (**FIG. 2**) is currently tuned). If Prime Time is selected for the current date, and the current time period is later than the starting Prime Time hour defined by the operating parameters, the program grid **112** preferably displays program schedule information starting at the beginning of prime time if the data are still available. If the data have been discarded because they are no longer valid, program schedule information is displayed starting at the beginning of the database. Alternatively, the invention may be implemented so that the next prime time period (tomorrow's) is displayed.

[**0067**] In the example shown in **FIG. 5**, the time bar **102** indicates that prime time scheduling has been set to start at 7:00 PM. A program cell **136** is shown highlighted to indicate the location of the cursor. The viewer can use the six navigation keys on the remote control **78** to navigate in the program grid **112**, as described above in connection with **FIG. 4**. The viewer can even use the navigation keys to scroll back to the Hot Picks navigation point, if so desired. However, the viewer may prefer instead to invoke the quickmenu **116** (**FIG. 3**) by pressing the menu button in order to take advantage of the Hot Picks menu selection. The same data are made available to the viewer regardless of which method of navigation is used. Thus, the selection of navigation points from the quickmenu **116** (**FIG. 3**) has no effect on the underlying data. They simply allow the viewer to move quickly from one point to another while in the Program Guide display mode.

[0068] In the preferred embodiment, use of either the Hot Picks or Prime Time navigation point from the quickmenu **116** (**FIG. 3**) results in a display of program schedule information beginning with the prescribed starting prime time hour (e.g., 7:00 PM) without regard to the current time period or the channel to which the tuning circuitry **72** (**FIG. 2**) is tuned. The navigation keys may then be used by the viewer to horizontally scroll the program grid **112** and the time bar **102** to display program schedule information for other time periods—including the current time period (if the current time period is earlier than the starting prime time hour). The navigation keys on the remote control **78** (**FIG. 2**) can also be used to scroll to program schedule information corresponding to programs scheduled for telecast on later dates. The date cell **106** automatically displays the date corresponding to the program schedule information displayed in the program grid **112**.

[0069] **FIG. 6** depicts the program guide screen **100** as it appears when the viewer selects the What's On navigation point from the quickmenu **116** (**FIG. 3**). Program schedule information corresponding to the main channel line-up is displayed in the program grid **112**, starting at the half hour time period immediately preceding the current time period. Navigation is accomplished in the same manner described above in connection with **FIGS. 4 and 5**. The Menu key remains available for invoking the quickmenu **116** (**FIG. 3**). The Select key is used to select the highlighted program for viewing or recording, or to display additional information about the highlighted program.

[0070] In an alternative embodiment of the invention, selection of the What's On navigation point causes a display of program schedule information starting at the time period following the current time period. Thus, if the current time period is the 2:00 PM time period, program schedule information is displayed in the program grid **112** (FIGS. **3-6**) starting at the 2:30 PM time period.

[0071] Yet another alternative embodiment is described in connection with **FIG. 29**. In this embodiment, a Program Guide screen **140** includes a time bar **142**, a channel bar **144**, and a program grid **146** that operate in substantially the same manner as described above in connection with FIGS. **3-6**. However, in this embodiment, the program grid **146** includes a navigation cell **148** that preferably contains at least two icons representing navigation points. The icons may represent any of the navigation points discussed above, but in this example, the navigation cell **148** includes an "What's On" icon **150** and a "Hot Picks" icon **152**. The icon **150** is shown highlighted, indicating the location of a cursor. The viewer can navigate the cursor from any of the program cells in the program grid **146** to either of the icons **150** and **152** using the navigation keys on the remote control **78** (**FIG. 2**), as described above.

[0072] Unlike the program cells contained in the program grid **146**, the navigation cell **148** may be viewed as "stationary" in that it does not move with the rest of the program cells as the viewer navigates in the program grid **146**. Rather, the navigation cell **148** preferably remains in the lower right corner of the program grid **146**, even as the channels and times change in the channel bar **144** and the time bar **142**, respectively. Thus, the viewer is always able to navigate the cursor to one of the icons **150** and **152** displayed in the navigation cell **148**.

[0073] Pressing the Select key on the remote control **78** (**FIG. 2**) while one of the icons **150** or **152** is highlighted causes the interactive program guide to navigate the program grid **146** to the navigation point indicated in the selected icon. For example, after the What's On icon **150** is selected, the interactive program guide navigates the program grid **146** to the current time period. If the Hot Picks icon **152** is selected, the program grid **146** then displays program schedule information for the premium channel line-up starting at the earliest prime time hour defined by the operational parameters. Essentially, selecting an icon from the navigation cell **148** has the same effect as selecting the corresponding navigation point from the quickmenu **116** (**FIG. 3**). The advantage offered by this embodiment is that the viewer does not have to invoke the quickmenu **116** (**FIG. 3**) in order to rapidly navigate to a desired location in the program schedule information.

[0074] Turning now to **FIG. 7, a** program search screen **200** is described. The program search screen **200** appears on the display **84** (**FIG. 2**) when the viewer selects the Program Search display mode from the quickmenu **116** (**FIG. 3**). In accordance with the invention, the Program Search display mode allows the viewer to chose a restrictive search selection criterion and a nonrestrictive sort attribute. The selection criterion and sort attribute are applied to the program schedule information to assist the viewer in locating programs of interest.

[0075] Like the screen **100** (FIGS. **3-6**), the screen **200** includes the title bar **124**. The title bar **124** contains the clock cell **126** displaying the current time, and an indication that the viewer can invoke the quickmenu **116** (**FIG. 3**) by pressing the Menu key on the remote control **78** (**FIG. 2**). When the Menu key is pressed, the quickmenu **116** (**FIG. 3**) appears immediately above the title bar **124**, partially covering some of the other information on the screen **200**. The quickmenu **116** (**FIG. 3**) operates in the Program Search display mode in the same manner described above for the Program Guide display mode.

[0076] When the quickmenu **116** (**FIG. 3**) is not displayed, the area above the title bar **124** in the screen **200** is divided into three functional regions—a search selection menu **202**, a sort menu **204**, and a program menu **206**. The search selection menu **202** is used by the viewer to choose a single restrictive search selection criterion from a plurality of available search selection criteria. The sort menu **204** is used by the viewer to choose a single nonrestrictive sort attribute from a plurality of available sort attributes. Program schedule information corresponding to programs that meet the chosen search selection criterion are displayed in the program menu **206** in the order indicated by the chosen sort attribute. It should be noted that although the preferred embodiment of the invention uses only a single selection criterion and a single sort attribute, combinations of multiple selection criteria with a single sort attribute, or a single selection criterion with multiple sort attributes, or multiple selection criteria with multiple sort attributes may be used without departing from the spirit of the invention.

[0077] When the screen **200** first appears on the display **84** after the Program Search display mode is selected from the quickmenu **116** (**FIG. 3**), an active selection criterion cell **208** appears highlighted, representing the location of a cursor. The presence of the cursor in the search selection

menu **202** means that the viewer can interact with the menu **202** by using the Up and Down Arrow Keys on the remote control **78** (**FIG. 2**). By using the Left and Right Arrow Keys, the viewer can move the cursor to the sort menu **204** or the program menu **206**. Whichever one of the menus **202**, **204**, or **206** contains the cursor is the active menu (i.e., the menu that the viewer can interact with).

[**0078**] When the search selection menu **202** is active, the viewer can use the Up and Down Arrow keys to choose a single search selection criterion from among the available selection criteria. Pressing the Down Arrow Key causes the selection criterion displayed in a next search cell **210** (e.g., "Drama") to appear in the active selection criterion cell **208**. Pressing the Up Arrow Key causes the selection criterion displayed in a previous search cell **212** to appear in the active selection criterion cell **208**. The search selection menu **202** preferably operates in an endless loop fashion, with additional selection criteria being displayed as the viewer scrolls the menu **202**. The available selection criteria are stored as operational parameters in the memory **76**, which, as explained above, may be defined by either the data center **52** (**FIG. 1**) or the headend telecasting center **54** (**FIG. 1**). Selection criteria may include, but are not limited to, Movies, Drama, Action, Science Fiction, Comedy, Sports, TV, Documentaries, Pay Per View, On in Next Hour, etc. The order in which the available selection criteria are presented is also determined by the operational parameters. In addition, the "default selection criterion" (i.e., the selection criterion that appears in the active selection criterion cell **208** when the Program Search display mode is invoked) is also defined by the operational parameters. Thus, the data center **52** (**FIG. 1**) or the headend telecasting center **54** can set the default selection criterion to a selection criterion that may be of interest to a large segment of the viewing population. For example, it may be desirable to set the default selection criterion to Pay Per View if a popular movie is being shown that evening. Programs meeting the default search selection criterion are made available for viewer selection in the program menu **206** when the screen **200** is displayed after the Program Search display mode is selected.

[**0079**] The selection criterion that appears in the active selection criterion cell **208** is preferably automatically applied to the program schedule information to present a listing of program schedule information meeting the single selection criterion. In other words, the viewer does not need to press the Select key (or any other key) in order to apply the search selection criterion to the program schedule information. Rather, programs that meet the active search selection criterion are made available for user selection in the program menu **206** as the viewer scrolls the search selection menu **202**. Thus, each time the Up Arrow or Down Arrow Key is pressed, the program schedule information displayed in the program menu **206** changes in accordance with the new selection criterion displayed in the active selection criterion cell **208**. Search selection is restrictive in the sense that programs which do not meet the active search selection criterion are not made available for viewer selection in the program menu **206**. In an alternative embodiment, the selection criterion is not automatically applied to the program schedule information. Rather, the criterion is not applied until the viewer presses the Select key.

[**0080**] When the viewer moves the cursor to the sort menu **204**, an active sort attribute cell **214** is highlighted (the highlighting is not shown in **FIG. 7**). When the active sort attribute cell **214** is highlighted, the viewer can use the Up and Down Arrow keys to select a sort attribute to be applied to the program schedule information displayed in the program menu **206**. Pressing the Down Arrow key causes the sort attribute displayed in a next sort cell **216** to appear in the active sort attribute cell **214**. Pressing the Up Arrow key causes the sort attribute displayed in a previous sort cell **218** to appear in the active sort attribute cell **214**. Like the search selection menu **202**, the sort menu **204** preferably operates in an endless-loop fashion. Unlike the search selection criteria, the sort attributes are nonrestrictive and do not operate to select program schedule information to be presented in the displayed list of program schedule information. Thus, when the viewer changes the sort attribute, the result is simply a change in the order in which programs meeting the active search selection criterion are displayed in the program menu **206**.

[**0081**] The sort attributes available for viewer selection are defined by the operational parameters stored in the memory **76** (**FIG. 2**). The default sort attribute (i.e., the one that is active when the Program Search display mode is invoked) is also defined by the operational parameters. Moreover, the operational parameters may define a different set of sort attributes for each search selection criterion. For example, if the selection criterion displayed in the active selection criterion cell **208** is "Movies", the sort attributes available in the sort menu **204** may include certain generic sort attributes such as sort by "Telecast Time,""Alphabetize," and sort in "Channel" order, but it may also include sort by "Rating." Since "Rating" normally would not apply to the selection criterion "Sports," it is not made available in the sort menu **204** when "Sports" is the active selection criterion. Instead, the sort menu **204** may offer sort by "Sport" as a sort attribute, which if selected, would cause the sports programs to be grouped by sport (e.g., baseball, football, soccer, etc.). The order in which the sports are presented is determined by the operational parameters.

[**0082**] The program menu **206** displays program schedule information for programs that meet the active search selection criterion, in an order determined by the active sort attribute. The user can navigate in the program menu **206** when one of the program choice cells **220** is highlighted (indicating the presence of the cursor).

[**0083**] The program menu **206** includes a menu header **222** that identifies the number of programs that meet the active search selection criterion. At least one group header **224** is also displayed in the program menu **206**. The group headers **224** identify the subgroups that resulting from the application of the active sort attribute to the program schedule information.

[**0084**] The program choice cells **220** preferably contain the program titles, telecast times, and channels (call signs or channel numbers) of programs that meet the active search selection criterion. However, if the active sort attribute is "Telecast Time," the telecast times are preferably displayed in the group headers **224** instead of the program choice cells **220**. Similarly, if the active sort attribute is "Channel," the call signs are preferably displayed in the group headers **224** instead of the program choice cells **220**.

[0085] The viewer uses the Up and Down Arrow keys to navigate in the program menu **206**. The cursor appears only on the program cells **220** (not the group headers **224**). In order to view more program schedule information meeting the active search selection criterion, the viewer can scroll the program menu **206** by pressing the Up Arrow key while the cursor is on the first displayed program, or the Down Arrow key while the cursor is on the last displayed program. The program menu **206** preferably operates in an endless-loop fashion.

[0086] In order to select a program for viewing or recording, or to see additional information about a program, the viewer presses the select key while the program choice cell **220** corresponding to a program of interest is highlighted. These features are described in greater detail below in connection with **FIG. 10**.

[0087] As mentioned above, the quickmenu **116** (**FIG. 3**) is preferably context sensitive. When the quickmenu **116** (**FIG. 3**) is invoked from the Program Search display mode, it preferably includes a menu selection identified as "Return." Like the above-described navigation points, selection of the Return menu choice invokes the Program Guide display mode. However, when Return is selected, the screen **100** (FIGS. **3-6**) includes program schedule information corresponding to the program identified in the last program choice cell **220** highlighted in the program menu **206**. This useful feature allows the viewer to consider other programs that may be scheduled for telecast at the same time as the highlighted program before making a selection.

[0088] Referring now to **FIG. 8, a** day to view screen **300** is described. The day to view screen **300** appears on the display **84** (**FIG. 2**) when the viewer selects the Day to View display mode from the quickmenu **116** (**FIG. 3**). In accordance with the invention, the Day to View display mode provides a convenient graphical user interface that allows the viewer to quickly navigate to program schedule information for programs to be telecast (or being telecast) on a specified date. The Day to View display mode provides for even more precise navigation by allowing the viewer to specify a day part (i.e., a range of hours) for the specified date. When the viewer returns to the program guide screen **100** (FIGS. **3-6**) after specifying a date and day part using the screen **300**, the program grid **112** navigates to program schedule information for the specified date and day part. However, it should be noted that the specified date and day part do not limit the amount of or in any sense restrictively select the program schedule information available or displayed to the viewer (i.e., they are not restrictive selection criteria). Rather, the Day to View display mode operates as a positioning tool.

[0089] Like the screen **100** (FIGS. **3-6**), the screen **300** includes the title bar **124**. The title bar **124** contains the clock cell **126** displaying the current time, and an indication that the viewer can invoke the quickmenu **116** (**FIG. 3**) by pressing the Menu key on the remote control **78** (**FIG. 2**). When invoked, the quickmenu **116** (**FIG. 3**) appears immediately above the title bar **124**. The quickmenu **116** (**FIG. 3**) operates in the Day to View display mode in the same manner described above for the Program Guide display mode.

[0090] The area of the screen **300** above the title bar **124** contains two viewer menus—a calendar menu **302** and a day part menu **304**. The calendar menu **302** resembles a conventional monthly calendar. The month selected for display in the calendar menu **302** is a month having dates for which program schedule information is available.

[0091] The heavy borders around calendar cells **306**, **308**, **310**, **312**, **314**, **316**, and **318** indicate that the memory **76** (**FIG. 2**) contains program schedule information for programs to be telecast (or being telecast) on those dates. As shown in **FIG. 8**, the memory **76** (**FIG. 2**) preferably stores program schedule information for seven days starting with the current date (in this example, February 9-15). Of course, the amount of program schedule information made available to the viewer may be varied without departing from the spirit of the invention. The cell **306** is also highlighted, indicating the presence of a calendar cursor. When the Day to View display mode is invoked, the cursor is placed in the cell corresponding to the last date for which program schedule information was considered in the Program Guide display mode. Thus, if the Day to View display mode is invoked immediately after the interactive program guide is activated (i.e., before the viewer attempts to navigate in the Program Guide display mode), the cursor will appear in the cell representing the current date, which is the first of the heavily bordered cells. In the example shown in **FIG. 8**, the cell **306** represents the current date.

[0092] In order to select a new date, the viewer uses the Left and Right Arrow keys on the remote control **78** (**FIG. 2**) to move the cursor from one calendar cell to the next. The cursor can appear only in one of the heavily bordered cells **306**, **308**, **310**, **312**, **314**, **316**, and **318**. When the cell **306** is highlighted, pressing the Left Arrow key moves the cursor to the cell **318**. When the cell **318** is highlighted, pressing the Right Arrow key moves the cursor to the cell **306**.

[0093] Toward the end of any given month, the available program schedule information extends into the next month. In this situation, the month displayed in the calendar menu **302** automatically changes as the viewer attempts to move the cursor from one month to the next. For example, if program schedule information is available for the period from February 27 through March 5, pressing the Right Arrow key while cell **320** (February 28) is highlighted causes the calendar **302** to switch to the next month. The cursor would appear on the cell for March 1 (not shown). Pressing the Left Arrow key while the cursor is on the cell for March 1 results in a redisplay of the February calendar in the calendar menu **302**.

[0094] The day part menu **304** preferably includes a plurality of day part cells **322**. In the example shown in **FIG. 8**, the day part menu **304** includes six day part cells **322** each representing four hours of program schedule information.

[0095] One of the day part cells **322** (the Morning cell) is highlighted to represent the location of a day part cursor. Similar to the calendar cursor, the day part cursor initially appears on the day part that was most recently considered in the Program Guide display mode (FIGS. **3-6**). The viewer moves the day part cursor by pressing the Up or Down Arrow key on the remote control **78** (**FIG. 2**). Thus, the calendar cursor and the day part cursor are simultaneously displayed in the screen **300**. However, they respond to different keys on the remote control **78** (**FIG. 2**). The cursor wraps around the day part menu **304** as needed.

[0096] After a date and day part have been selected, the viewer can return to the Program Guide display mode

(FIGS. **3-6**) to view program schedule information for the date and day part selected. This is accomplished by pressing the Select key, or by invoking the quickmenu **116** (**FIG. 3**) by pressing the Menu key, and then selecting the context sensitive menu choice "Return." The program grid **112** then navigates to the selected date and day part.

[**0097**] Referring now to **FIG. 9, a** favorite channel screen **400** is described. The favorite channel screen **400** appears on the display **84** (**FIG. 2**) when the viewer selects the Favorite Channel display mode from the quickmenu **116** (**FIG. 3**). The Favorite Channel display mode allows the viewer to select a favorite channel line-up, which is used to sort the channels displayed in the Program Guide display mode. By selecting a favorite channel line-up, the viewer can sort the program schedule information displayed in the Program Guide display mode, so that the channels that the viewer is most interested in appear first, in the order selected by the viewer. Program schedule information for the other channels follow thereafter. The selected favorite channel line-up is preferably operative only in the Program Guide display mode (FIGS. **3-6**). It preferably has no effect on the Program Search display mode (**FIG. 7**). In addition, the favorite channel line-up is preferably not applied to the premium channel line-up.

[**0098**] Like the screens **100**, **200** and **300**, the screen **400** includes the title bar **124** with the clock cell **126**. The quickmenu **116** (**FIG. 3**) is also available.

[**0099**] The screen **400** also includes two menus—a full channel line-up menu **402** and a favorite channel line-up menu **404**. The menu **402** presents a list of the channels provided by the headend telecasting center **54** (**FIG. 1**). The menu **402** contains a plurality of cells **406** and **408**, each displaying a channel number and call sign for one of the available channels. The cell **406** is shown highlighted to represent the location of a cursor. The Up and Down Arrow keys are used to move the cursor from one cell to the next. The menu **402** displays a subset of the available channels, but the viewer can scroll the menu **402** to consider other channels in the full channel line-up. The menu **402** preferably operates in an endless loop fashion.

[**0100**] The menu **404** also contains a plurality of cells **410** for displaying channel numbers and call signs corresponding to the viewer's favorite channel line-up. When the Favorite Channel display mode is invoked, the viewer's previously selected favorite channel line-up is retrieved from the memory **76** (**FIG. 2**). In the example shown in **FIG. 8**, the viewer's favorite channel line-up includes the nine channels shown in the cells **410**. An unused cell **412** is left empty. If the viewer had not previously established a favorite channel line-up, the menu **404** would consist of an array of empty cells **412**. If the viewer's favorite channel line-up includes more channels then can be displayed at once, the menu **404** can be scrolled (like the menu **402**) to display additional channels. To scroll the menu **404**, the viewer first moves the cursor to the menu **404** by using the Left or Right Arrow key.

[**0101**] The screen **400** also includes a select icon **414**. The cursor can be placed on the select icon **414** by using the Left or Right Arrow key. When the Select key on the remote control **78** (**FIG. 2**) is pressed while the select icon **414** is highlighted, the favorite channel line-up in the menu **404** is stored in the memory **76** (**FIG. 2**), and the interactive program guide returns to the Program Guide display mode (FIGS. **3-6**). The program schedule information is then presented in accordance with the viewer's stored favorite channel line-up.

[**0102**] The viewer establishes a favorite channel line-up by selecting channels from the menu **402** and inserting the selected channels into desired locations in the menu **404**. For example, in order to insert the channel indicated in the cell **406** (i.e., channel 2) into the favorite channel line-up, the viewer presses the Select key while the cursor is on the cell **406**. The cursor then automatically jumps to the first empty cell in the menu **404**, which is the cell **412** in the example shown in **FIG. 9**. The channel number and call sign are also displayed in the cell **412** (not shown in **FIG. 9**). The viewer then presses the Select key to temporarily insert the selected channel at the highlighted location (e.g., the cell **412**). It should be noted that the favorite channel line-up need not be assembled in numerical order. The channel sequence defined by the viewer in the screen **400** is used to present schedule information in the Program Guide display mode (FIGS. **3-6**).

[**0103**] In order to remove channels from the favorite channel line-up, the viewer moves the cursor to the menu **404** without selecting a channel from the menu **402**. The viewer can then move the cursor to any cell containing a channel identification (e.g., any one of the cells **410**). Pressing the Select key while one of the cells **410** is highlighted causes a prompt (not shown) to be displayed requesting confirmation of the deletion. The deletion can be confirmed by pressing the Select key. When the Select key is pressed, the channel appearing in the highlighted cell is erased. The emptied cell may be later filled with another channel, or it may be left empty, thereby reducing the size of the favorite channel line-up.

[**0104**] When the viewer is satisfied with the favorite channel line-up, the Left or Right Arrow key may be used to move the cursor to the select icon **414**. By then pressing the Select key, the favorite channel line-up is stored and applied, as described above. In order to exit the screen **400** without saving the changes, the quickmenu **116** (**FIG. 3**) may be invoked.

[**0105**] Once a favorite channel line-up has been stored in the memory **78** (**FIG. 2**), it is automatically applied to the program schedule information each time the interactive program guide is invoked. In an alternative embodiment, the interactive program guide allows for creation and storage of several different favorite channel line-ups (e.g., one for each member of a household). To accomplish this, the interactive program guide requests a personal identification number (not shown) each time the guide is invoked. The personal identification number is used to uniquely identify each favorite channel line-up.

[**0106**] It may also be desirable to allow the viewer to disable the favorite channel line-up. This may be accomplished by including a context sensitive menu choice in the quickmenu **116** (**FIG. 3**) labeled "Disable" (not shown). Selecting Disable prevents the application of the favorite channel line-up for the current session, or until the viewer returns to the screen **400** to select a context sensitive "Enable" menu choice (not shown) from the quickmenu **116** (**FIG. 3**).

[**0107**] Turning now to **FIG. 10, a** program selection screen **500** is described. The program selection screen

appears on the display **84** (**FIG. 2**) when the viewer selects a program from either the screen **100** in the Program Guide display mode (FIGS. **3-6**) or the screen **200** in the Program Search display mode (**FIG. 7**). The program selection screen **500** is also displayed when the viewer selects the menu choice "Player" (not shown) from the quickmenu **116** (**FIG. 3**). As shown in **FIG. 10**, the screen **500** includes the title bar **124** with the clock cell **126**. The quickmenu **116** (**FIG. 3**) can be invoked from the screen **500** by pressing the Menu key on the remote control **78** (**FIG. 2**).

[**0108**] The screen **500** further includes a program title window **502**, a description window **504**, a video clip window **56**, and a menu window **508**. When the screen **500** is invoked by selecting a program from either the screen **100** (FIGS. **3-6**) or the screen **200** (**FIG. 7**), the program title window **502** displays the title of the selected program. In addition, the description window **504** displays more information which may be included in the program schedule information stored in the memory **76** (**FIG. 2**) for the selected program. Such information may include the telecast date and time, the channel, featured performers, MPAA rating, etc.

[**0109**] The video clip window **506** is used to display a short video clip relating to the selected program (if a video clip is included in the program schedule information for the selected program). This feature is described in commonly assigned, copending U.S. patent application Ser. No. 08/246,949 entitled "Video Clip Program Guide," which is hereby incorporated by reference in its entirety.

[**0110**] When the screen **500** is invoked from the quickmenu **116** (**FIG. 3**), the windows **502**, **504**, and **506** are empty.

[**0111**] The choices presented in the menu window **508** also depend on the circumstances under which the screen **500** is invoked. The choices shown in **FIG. 10** are presented when the viewer selects, from the screen **100** (FIGS. **3-6**) or the screen **200** (**FIG. 7**), a program that is not currently being telecast. A choice **510** is shown highlighted to represent the location of a cursor. The Up and Down Arrow keys may be used to move the cursor from one choice to the next. The Select key is used to select a menu choice.

[**0112**] The menu choice "Add to Scheduled Viewing List" is used to add an entry for the selected program into the scheduled viewing list. When the current time approaches or matches the telecast time for a program listed in the scheduled viewing list, the display **84** (**FIG. 3**) displays a prompt (not shown) notifying the viewer that a program of interest is about to start. The prompt is displayed (as long as the display **84** is on) even if the interactive program guide is not active. The viewer can clear the prompt by pressing any navigation key on the remote control **78** (**FIG. 2**).

[**0113**] The menu choice "Add to Recording List" is used to add an entry for the selected program into a recording list. When the current time approaches or matches the telecast time for a program listed in the Recording List, the control unit **74** (**FIG. 2**) causes the tuning circuitry **72** (**FIG. 2**) to tune to the appropriate channel. Through the IR transmitter **90** (**FIG. 2**), the control unit **74** (**FIG. 2**) also causes the VCR **88** (**FIG. 2**) to begin recording at the appropriate time (assuming that the VCR **88** (**FIG. 2**) had been turned on by the viewer beforehand).

[**0114**] The menu choice "View Scheduled Viewing List" is used to invoke a display (not shown) listing program schedule information for programs that have been added to the scheduled viewing list. The menu choice "View Recording List" operates similarly with respect to the recording list. Preferably, the displayed information (not shown) includes the title, telecast time, and channel for each program. The navigation keys on the remote control **78** (**FIG. 2**) may be used to clear either of the displayed lists.

[**0115**] The menu selection "Other Times" is used to display a list of telecast times (not shown) other than the selected time, for the selected program.

[**0116**] To exit the screen **500** and return to the screen from which it was invoked, the user selects the "Exit" menu choice. Alternatively, the quickmenu **116** (**FIG. 3**) may be used to exit the screen **500**.

[**0117**] If the screen **500** is invoked by selecting a program currently being telecast, the menu choices "Add to Scheduled Viewing List" and "Add to Recording List" are not displayed. Instead, the first menu choice preferably displayed is "Tune to Program." When "Tune to Program" is selected, the control unit **74** (**FIG. 2**) causes the tuning circuitry **72** (**FIG. 2**) to tune to the selected program. The selected program is then presented on the display **84** (**FIG. 2**).

[**0118**] When the screen **500** is invoked from the quickmenu **116** (**FIG. 3**), only the "View Scheduled Viewing List,""View Recording List" and "Exit" menu choices are available.

[**0119**] The present invention also contemplates the use of additional menu choices that would be appropriate in a duplex cable network (i.e., one that allows two-way communication between the set-top box **70** (**FIG. 2**) and the headend telecasting center **54** (**FIG. 1**)). For example, in such a system, when the viewer invokes the screen **500** by selecting a pay per view program from either the screen **100** (FIGS. **3-6**) or the screen **200** (**FIG. 7**), the menu choices may include an "Order Pay Per View" choice. If the viewer selects that choice, the set-top box **70** (**FIG. 2**) transmits the request to the headend telecasting center **54**.

[**0120**] The program schedule information stored in the memory **76** (**FIG. 2**) may also be used to provide an abbreviated program guide that allows the viewer to browse through the program schedule information while simultaneously watching a television program on the display **84** (**FIG. 2**). In order to implement the abbreviated guide, the remote control **78** (**FIG. 2**) preferably includes an additional key (labeled, e.g., "Browse") to invoke the abbreviated guide. The abbreviated guide is preferably displayed as an overlay on the television program being watched when the Browse key is pressed. The abbreviated guide is preferably displayed on the lower portion of the display **84** (**FIG. 2**) so as to not be unduly distracting.

[**0121**] The abbreviated guide provided in accordance with the present invention may be understood by reference to FIGS. **30-33**. A display **550** depicts the abbreviated guide as it may appear when it is first invoked. As shown in **FIG. 30**, when the abbreviated guide is invoked, it does not display program schedule information. Instead, the display **550** simply presents the title of the program that is currently being shown on the display **84** (**FIG. 2**). The channel

number (not shown) may also be displayed, but preferably in the upper left hand corner of the display **84** (**FIG. 2**). The channel number preferably remains displayed for about five seconds, or until the viewer presses any navigation key on the remote control **78** (**FIG. 2**). Thus, with a single press of the Browse key, the viewer is provided with an immediate and unobscured display of the channel and title of the program being shown on the display **84** (**FIG. 2**).

[**0122**] The display **550** is shown highlighted, indicating the presence of a cursor that the viewer can control using the navigation keys. If the viewer presses the Right Arrow key from the display **550**, the channel number in the upper left corner of the display **84** (**FIG. 2**) immediately disappears. In addition, a display **556** appears in place of the display **550**. The display **556** still does not present program schedule information (i.e., no channel is displayed). Rather, the display **556** includes a time bar **558** preferably containing four time cells **560** each representing a one half hour period of programming. The display **556** also includes a single-line program grid **562** containing, in this example, a plurality of program cells **564**, **566**, **568**, and **570**. Like the program cells of the program grid **112** (FIGS. **3-6**), the widths of the program cells **564**, **566**, **568**, and **570** vary in accordance with the lengths of the programs identified in the program cells. Thus, a program cell for a two hour program would span the entire width of the program grid **662**.

[**0123**] By pressing the Right Arrow key from the display **550**, the viewer moves the cursor to the program cell **566**. Further presses of the Right Arrow key cause the cursor to continue to move to the right until the program cell **570** is reached, at which point the program grid **562** and the time bar **558** scroll with continued Right Arrow key presses in order to display additional program titles for later time periods. The program grid **562** and time bar **558** also scroll to the left in response to Left Arrow key presses, as needed, preferably up to the current time period (i.e., the program cell **564**). However, when the program cell **564** is reached, the abbreviated guide preferably resumes the display **550** for the program currently being shown on the display **84** (**FIG. 2**). This presentation provides the viewer with immediate feedback that he or she has navigated back to the program title corresponding to the program being watched. When the display **550** is redisplayed in this manner, the channel is preferably displayed again in the upper left corner of the display **84** (**FIG. 2**) for about five seconds or until the next navigation key is pressed.

[**0124**] If the viewer presses the Down Arrow key from the display **550**, a display **551** is presented in place of the display **550**. The display **551** still does not present program schedule information (i.e., telecast times are not provided). The display **551** includes a single channel cell **552** containing a channel number and call sign, and a single program cell **554** containing the title of the program that is currently being telecast on the channel indicated by the channel cell **552**. Each time the viewer presses the Down Arrow key, the contents of the channel cell **552** and the program cell **554** are replaced with the appropriate information for the next channel in the sequence of available channels. The viewer can use the Up Arrow key to move back through the channels until the current channel is reached, at which time the display **551** is replaced with the display **550**.

[**0125**] Once the viewer navigates in a dogleg fashion (i.e., by moving the cursor away from both the current time period and the current channel), it becomes desirable to display program schedule information (i.e., telecast time, channel and title), as shown in a display **572**. The display **572** includes a channel cell **574**, a date cell **576**, a time bar **578** spanning one and a half hours, and a program grid **580**. The viewer can navigate in the program grid **580** in substantially the same manner as described above for the program grid **112** (FIGS. **3-6**)—the main difference being that program schedule information for only one channel is displayed at any given time.

[**0126**] The Select key on the remote control **78** (**FIG. 2**) is preferably operative in the abbreviated guide to cause the tuning circuitry **72** (**FIG. 2**) to tune to the highlighted program, if the program is currently being telecast. Otherwise, the Select key has no effect. In an alternative embodiment, the Select key may instead be used to invoke the player screen **500** (**FIG. 10**) to allow the viewer to schedule the highlighted program for later viewing or recording.

[**0127**] The abbreviated guide preferably remains on the display **84** (**FIG. 2**) for a predetermined period of time following the last key press on the remote control **78** (**FIG. 2**) (preferably about five seconds), after which it is automatically cleared.

[**0128**] Referring now to FIGS. **11-28**, a series of logic flow diagrams are described which represent at a functional level, a control program executed by the control unit **74** (**FIG. 2**) for implementing the interactive program guide of the present invention.

[**0129**] A main program loop **600** is described in connection with **FIG. 11**. Although the main program loop **600** is represented as a conventional top-down flowchart, it is preferably implemented as a collection of interrupt-driven routines which perform the stated functions. The program begins with test **602** where the control unit **74** (**FIG. 2**) determines if program schedule information and/or software (including operational parameters) which are not currently stored in the memory **76** (**FIG. 2**) are being received from the headend telecasting center **54** (**FIG. 1**). If such data or software is being received, the control unit **74** (**FIG. 2**) stores the received data in the memory **76** (**FIG. 2**) at step **604**. Otherwise, the control unit **74** (**FIG. 2**) performs test **606** to determine if the current time is approaching a program telecast time stored in either the scheduled viewing list or the recording list in memory **76** (**FIG. 2**).

[**0130**] If the current time is approaching a stored telecast time, the control unit (**FIG. 2**) then determines at test **608**, which list the telecast time is stored in. If the telecast time is stored in the scheduled viewing list, the control unit **74** (**FIG. 2**) causes the display **84** (**FIG. 2**) to display a prompt (as long as the display **84** is turned on) notifying the viewer that a scheduled program is about to be telecast. In an alternative embodiment, the control unit **74** (**FIG. 2**) may cause the display **84** (**FIG. 2**) to display several prompts prior to the scheduled telecast time (e.g., one each minute for the three minutes preceding the scheduled telecast time. Of course, other prompt schedules may be used as deemed appropriate. After the last prompt is displayed, the control unit **74** (**FIG. 2**) deletes the entry for the scheduled program from either the scheduled program list or the recording list at step **612**.

[**0131**] If it is determined at test **608** that the telecast time is stored in the recording list, the control unit **74** (**FIG. 2**)

proceeds to step **614**, where it causes the tuning circuitry **72** (**FIG. 2**) to tune to the channel on which the scheduled program is being transmitted. Then at step **616**, the control unit **74** (**FIG. 2**) then causes the VCR **88** (**FIG. 2**) to begin recording at the stored telecast time. The control unit **74** (**FIG. 2**) then deletes the entry for the scheduled program at step **612**.

[**0132**] After step **612**, or if the control unit **74** (**FIG. 2**) determines at test **606** that the current time is not approaching a stored telecast time, a test **618** is performed to determine if the viewer has pressed the Guide key on the remote control **78** (**FIG. 2**). If not, the control unit **74** (**FIG. 2**) loops back to the test **602**. If the Guide key has been pressed, the control unit **74** (**FIG. 2**) then determines if the interactive program guide is currently active at test **620**. If it is, the control unit **74** (**FIG. 2**) deactivates the guide at step **622**. If not, a navigation point is set to "Hot Picks" at step **624**, and a Program Guide routine (described below in connection with FIGS. **12-13**) is then invoked at step **626**. The control unit **74** (**FIG. 2**) loops back to test **602** after either step **622** or **626** is performed.

[**0133**] As mentioned above, the functions described with respect to **FIG. 11** are preferably implemented through the use of interrupt-driven routines. Thus, the control unit **74** (**FIG. 2**) is preferably responsive to the scheduled viewing list, the recording list, and Guide key presses while the interactive program guide is operating in any of the previously described display modes.

[**0134**] FIGS. **11-12** represent the Program Guide routine **628**, which is performed by the control unit **74** (**FIG. 2**) in order to provide the Program Guide display mode (FIGS. **3-6**). After the Program Guide routine **628** is invoked, a series of tests **630**, **632**, **634**, **636**, and **638** are performed to determine how the control unit **74** (**FIG. 2**) will present program schedule information in the program guide screen **100** (FIGS. **3-6**).

[**0135**] If it is determined at test **630** that the Hot Picks navigation point is set, the control unit **74** (**FIG. 2**) then determines at test **640** whether the current time period is later than the starting prime time stored in the memory **76** (**FIG. 2**). If it is, test **641** is performed to determine if earlier prime time data are still available for display. If earlier data are not available (because such data were discarded), the control unit **74** (**FIG. 2**) at step **642** causes the display **84** (**FIG. 2**) to display the premium channel line-up in the screen **100** (FIGS. **3-6**) starting at the beginning of the database, or alternatively, at the beginning of tomorrow's prime time. If the current time period is not later than the starting prime time hour (test **640**), or if earlier prime time data is available (test **641**), the control unit **74** (**FIG. 2**), at step **644**, causes the display **84** (**FIG. 2**) to display the premium channel line-up starting at the prescribed prime time hour (e.g., 7:00 PM) in the screen **100** (FIGS. **3-6**). After either step **642** or **644**, test **646** is performed to determine if the current execution of the Program Guide routine **628** is the first execution since the Guide key was pressed. If it is, the Quickmenu (described below in connection with FIGS. **14-15**) is invoked at step **648**. If not, or after step **648** is completed, the control unit **74** (**FIG. 2**) proceeds to test **632**.

[**0136**] If it is determined at test **632** that the Prime Time navigation point is set, the control unit **74** (**FIG. 2**) then determines at test **650** whether the current time period is later than the starting prime time stored in the memory **76** (**FIG. 2**). If it is, test **651** is performed to determine if earlier prime time data is still available for display. If earlier data is not available (because such data were discarded), the control unit **74** (**FIG. 2**), at step **652**, causes the display **84** (**FIG. 2**) to display the main channel line-up in the screen **100** (FIGS. **3-6**) starting at the beginning of the database, or alternatively, at the beginning of tomorrow's prime time. If the current time period is not later than the starting prime time hour (test **650**), or if earlier prime time data is available (test **651**), the control unit **74** (**FIG. 2**), at step **654** causes the display **84** (**FIG. 2**) to display the main channel line-up (which may be sorted in accordance with the viewer's favorite channel selections) starting at the current time period in the screen **100** (FIGS. **3-6**). After either step **652** or **654**, the control unit **74** (**FIG. 2**) proceeds to test **634**.

[**0137**] At test **634**, the control unit (**FIG. 2**) determines if the What's On navigation point is set. If it is, at step **656**, the control unit **74** (**FIG. 2**) causes the display **84** (**FIG. 2**) to display the main channel line-up (which may be sorted in accordance with the viewer's favorite channel selections) starting at the current time period in the screen **100** (FIGS. **3-6**). After step **656**, the control unit (**FIG. 2**) proceeds to test **636**. Alternatively, the system may be programmed to display the main channel line-up starting at the time period following the current time period, or at some other time not including a current time period.

[**0138**] At test **636**, the control unit (**FIG. 2**) determines if the Program Guide routine was invoked from the Program Search display mode (described below in connection with FIGS. **19-21**). If it was, at step **658**, the control unit **74** (**FIG. 2**) causes the display **84** (**FIG. 2**) to display program schedule information in the screen **100** (FIGS. **3-6**), starting with the program referenced by a pointer set in the Program Search routine (FIGS. **19-21**). After step **658**, the control unit (**FIG. 2**) proceeds to test **638**.

[**0139**] At test **638**, the control unit (**FIG. 2**) determines if the Program Guide routine was invoked from the Day to View display mode (described below in connection with FIGS. **22-23**). If it was, at step **660**, the control unit **74** (**FIG. 2**) causes the display **84** (**FIG. 2**) to display program schedule information in the screen **100** (FIGS. **3-6**), starting at the date and day part selected in the Day to View routine (FIGS. **22-23**).

[**0140**] After the control unit **74** (**FIG. 2**) presents program schedule information in the screen **100** (FIGS. **3-6**), test **662** is performed to determine if the Menu key on the remote control **78** (**FIG. 2**) has been pressed. If the Menu key has been pressed, step **664** is performed to invoke the Quickmenu (FIGS. **14-15**). If not, and after the step **664** is performed, the control unit **74** (**FIG. 2**) proceeds to step **666** to display a cursor in the program grid **112** (FIGS. **3-6**). Initially, the cursor is placed on the first program in the program grid **112** (FIGS. **3-6**) (i.e., the program displayed in the upper left-most cell in the program grid **112**). However, when the cursor is displayed after the viewer returns from the quickmenu (FIGS. **14-15**), the cursor is placed on the cell that was highlighted before the quickmenu was invoked.

[**0141**] After step **666**, test **668** is performed to determine if the viewer has pressed a navigation key on the remote control **78** (**FIG. 2**). If a navigation key was pressed, test **670**

is performed to determine if the next program cell to be highlighted is currently displayed in the program grid **112** (FIGS. **3-6**). If it is, the cursor is displayed in the appropriate program cell at step **672**. If not, at step **674**, the control unit **74** (**FIG. 2**) first causes the display **84** (**FIG. 2**) to scroll the program grid **112** (FIGS. **3-6**) (along with either the channel bar **108** (FIGS. **3-6**) or the time bar **102** (FIGS. **3-6**)) by an amount sufficient to display the appropriate program cell. Step **672** is then performed to move the cursor to the newly displayed program cell.

[**0142**] If a navigation key was not pressed, or after the cursor has been moved, test **676** is performed to determine if the Select key on the remote control **78** (**FIG. 2**) was pressed. If the Select key was pressed, the Selection routine (described below in connection with FIGS. **16-18**) is invoked at step **678**. If not, or upon returning from the Selection routine (FIGS. **16-18**), the control unit **74** (**FIG. 2**) loops back to test **662** to wait for the viewer to press a key.

[**0143**] **FIGS. 14 and 15** represent the Quickmenu routine **680**. After the Quickmenu **680** is invoked, step **682** is performed, where the control unit **74** (**FIG. 2**) retrieves from the memory **76** (**FIG. 2**), the quickmenu choices for the display mode from which the quickmenu was invoked. The control unit **74** (**FIG. 2**) then causes the display **84** (**FIG. 2**) to display the quickmenu **116** (**FIG. 3**) on the lower portion of the screen **100**, **200**, **300**, **400**, or **500** at the step **684**. At step **686**, the control unit **74** (**FIG. 2**) positions the default quickmenu choice for the current display mode in the current choice cell **118** (**FIG. 3**).

[**0144**] At test **688**, the control unit **74** (**FIG. 2**) checks if the viewer pressed the Menu key or the Up Arrow Key on the remote control **78** (**FIG. 2**). If one of those keys was pressed at step **692**, the quickmenu **116** (**FIG. 3**) is cleared and control then returns to the routine from which the Quickmenu routine **680** was invoked.

[**0145**] At test **694**, the control unit **74** (**FIG. 2**) checks if the viewer pressed the Left or Right Arrow key on the remote control **78** (**FIG. 2**). If one of those keys was pressed, the quickmenu **116** (**FIG. 3**) is scrolled in the appropriate direction at step **696**.

[**0146**] After test **694** or step **696**, the control unit **74** (**FIG. 2**) performs a series of tests to determine the viewer's quickmenu choice. At test **698**, the control unit **74** (**FIG. 3**) determines if the viewer selected the "Hot Picks" navigation point. If so, step **700** is performed to set the navigation point to "Hot Picks." The quickmenu **116** (**FIG. 3**) is then cleared and control is passed to the Program Guide routine (FIGS. **12-13**) at step **702**.

[**0147**] At test **704**, the control unit **74** (**FIG. 2**) determines if the viewer selected the "Prime Time."The quickmenu **118** is then cleared and control is passed to the Program Guide routine (FIGS. **12-13**) at step **708**.

[**0148**] At test **710**, the control unit **74** (**FIG. 2**) determines if the viewer selected the "What's on" navigation point. If so, step **712** is performed to set the navigation point to "What's On." The quickmenu **116** (**FIG. 3**) is then cleared and control is passed to the Program Guide routine (FIGS. **12-13**) at step **714**.

[**0149**] At test **716**, the control unit **74** (**FIG. 2**) determines if the view selected the Program Search display mode. If so, the quickmenu is then cleared and control is passed to a Program Search routine (described below in connection with FIGS. **19-21**) at step **718**.

[**0150**] At test **720**, the control unit **74** (**FIG. 2**) determines if the viewer selected the Day to View display mode. If so, the quickmenu **116** (**FIG. 3**) is then cleared and control is passed to a Day to View routine (described below in connection with FIGS. **22-23**) at step **722**.

[**0151**] At test **724**, the control unit **74** (**FIG. 2**) determines if the viewer selected the "Return" quickmenu choice from the Program Search display mode. If so, the quickmenu **116** (**FIG. 3**) is then cleared and control is passed to the Program Guide routine (FIGS. **12-13**) at step **726**.

[**0152**] At test **728**, the control unit **74** (**FIG. 2**) determines if the viewer selected the "Return" quickmenu choice from the Day to View display mode. If so, the quickmenu **116** (**FIG. 3**) is then cleared and control is passed to the Program Guide routine (FIGS. **12-13**) at step **730**.

[**0153**] At test **732**, the control unit **74** (**FIG. 2**) determines if the viewer selected the Favorite Channel display mode. If so, the quickmenu **116** (**FIG. 3**) is then cleared and control is passed to a Favorite Channel routine (described below in connection with FIGS. **24-28**) at step **734**.

[**0154**] At test **736**, the control unit **74** (**FIG. 2**) determines if the viewer selected the "Player' quickmenu choice. If so, the quickmenu **116** (**FIG. 3**) is cleared and control is passed to the selection routine (FIGS. **16-18**) at step **738**.

[**0155**] As shown in **FIG. 14**, the control unit **74** (**FIG. 2**) loops back to test **688** after test **736**. The loop is maintained until the viewer selects a menu choice from the quickmenu **116** (**FIG. 3**) or until the viewer presses the Menu or Up Arrow key.

[**0156**] FIGS. **16-18** represent the Selection routine **738**. After the Selection routine **738** is invoked, the control unit **74** (**FIG. 3**) displays the player screen **500** (**FIG. 10**) at step **740**. At test **742**, the control unit **74** (**FIG. 3**) determines if the viewer invoked the player screen **500** (**FIG. 10**) by selecting a program from either the Program Guide display mode (FIGS. **3-6**) or the Program Search display mode (**FIG. 7**). If the viewer selected a program, at step **744**, the title of the selected program is displayed in the title window **502**, and additional information about the selected program is displayed in the description window **504** (**FIG. 10**).

[**0157**] At step **746**, the control unit **74** (**FIG. 2**) displays the player menu in the menu window **508** (**FIG. 10**). As explained above in connection with **FIG. 10**, the choices available in the menu window **508** depend upon the circumstances under which the player screen **500** was invoked. The control unit **74** (**FIG. 2**) then performs a series of tests to determine the viewer's player menu choice.

[**0158**] At test **748**, the control unit **74** (**FIG. 2**) determines if the viewer selected the "Tune to Program" player menu choice (i.e., if the selected program is currently being telecast). If so, the interactive program guide is deactivated (i.e., cleared from the display **82** (**FIG. 2**)) at step **750**. The control unit **74** (**FIG. 2**) then causes the tuning circuitry **72** (**FIG. 2**) to tune to the channel that is carrying the selected program at step **752**. The program is then displayed on the display **84** (**FIG. 2**).

[0159] At test **754**, the control unit **74** (**FIG. 2**) determines if the viewer selected the "Add to Scheduled Viewing List" player menu choice (i.e., if the selected program is not currently being telecast). If so, test **756** is performed to determine if the viewer already scheduled the selected program for later viewing. If the selected program was not previously scheduled, an entry for the selected program is added to the scheduled viewing list in the memory **76** (**FIG. 2**) at step **758**. If the program was previously scheduled, test **760** is performed to determine if the viewer confirmed the deletion of the previously scheduled program from the scheduled viewing list. This may be accomplished, for example, by displaying a prompt on the display **84** (**FIG. 2**) requesting that the viewer press the Select key to confirm deletion or a navigation key to cancel the deletion. If the deletion is confirmed, the control unit **74** (**FIG. 2**) deletes the entry for the selected program from the scheduled viewing list at step **762**.

[0160] At test **764**, the control unit **74** (**FIG. 2**) determines if the viewer selected the "Add to Recording List" player menu choice (i.e., if the selected program is not currently being telecast). If so, test **766** is performed to determine if the viewer already scheduled the selected program for recording. If the selected program was not previously scheduled, an entry for the selected program is added to the recording list in the memory **76** (**FIG. 2**) at step **768**. If the program was previously scheduled, test **770** is performed to determine if the viewer confirmed the deletion of the previously scheduled program from the scheduled viewing list. This may be accomplished in the manner described above for the test **760**. If the deletion is confirmed, the control unit **74** (**FIG. 2**) deletes the entry for the selected program from the recording list at step **772**.

[0161] At test **774**, the control unit **74** (**FIG. 2**) determines if the viewer selected the "View Scheduled Viewing List" player menu choice. If so, the scheduled viewing list stored in the memory **76** (**FIG. 2**) is displayed on the display **84** (**FIG. 2**) at step **776**. At test **778**, the control unit **74** (**FIG. 2**) waits for the viewer to press the Select key on the remote control **78** (**FIG. 2**). Once the Select key is pressed, the scheduled viewing list is removed from the display **84** (**FIG. 2**) at step **780**.

[0162] At test **782**, the control unit **74** (**FIG. 2**) determines if the viewer selected the "View Recording List" player menu choice. If so, the recording list stored in the memory **76** (**FIG. 2**) is displayed on the display **84** (**FIG. 2**) at step **784**. At test **786**, the control unit **74** (**FIG. 2**) waits for the viewer to press the Select key on the remote control **78** (**FIG. 2**). Once the Select key is pressed, the recording list is removed from the display **84** (**FIG. 2**) at step **788**.

[0163] At test **790**, the control unit **74** (**FIG. 2**) determines if the viewer selected the "Other Times" player menu choice. If so, at step **792**, the control unit **74** (**FIG. 2**) searches the program schedule information stored in the memory **76** (**FIG. 2**) to determine if the selected program is scheduled for telecast at times other than the selected time. The list of alternative viewing times is displayed on the display **84** (**FIG. 2**). At test **794**, the control unit **74** (**FIG. 2**) waits for the viewer to press the Select key on the remote control **78** (**FIG. 2**). Once the Select key is pressed, the list of alternative viewing times is removed from the display **84** (**FIG. 2**) at step **796**.

[0164] At test **798**, the control unit **74** (**FIG. 2**) determines if the viewer selected the "Exit" player menu choice. If so, the control is returned to the routine from which the Selection routine **738** was invoked at step **800**.

[0165] At test **802**, the control unit **74** (**FIG. 2**) determines if the viewer pressed the Menu key on the remote control **78** (**FIG. 2**). If so, the Quickmenu routine (FIGS. **14-15**) is invoked at step **804**. After test **802**, the control unit **74** (**FIG. 2**) loops back to step **746** to wait for the viewer's selection.

[0166] FIGS. **19-21** represent the Program Search routine **806**. After the Program Search routine **806** is invoked, the control unit **74** (**FIG. 2**) retrieves the selection criteria from the memory **76** (**FIG. 2**) at step **808**. At step **810**, the control unit **74** (**FIG. 2**) sets the active selection criterion to the default selection criterion indicated by the operational parameters stored in the memory **76** (**FIG. 2**). At step **812**, a subset of the selection criteria are displayed in the select menu **202** (**FIG. 7**), with the default selection criterion appearing in the active selection criterion cell **208** (**FIG. 7**). At step **814**, the select menu **202** (**FIG. 7**) is designated the active menu.

[0167] At step **816**, the sort attributes associated with the active selection criterion are retrieved from the memory **76** (**FIG. 2**). At step **818**, the control unit **74** (**FIG. 2**) sets the active sort attribute to the default attribute indicated by the operational parameters stored in the memory **76** (**FIG. 2**) for the active selection criterion. At step **820**, a subset of the sort attributes are displayed in the sort menu **204** (**FIG. 7**), with the default sort attribute appearing in the active sort attribute cell **214** (**FIG. 7**).

[0168] At step **822**, the control unit **74** (**FIG. 2**) retrieves from the memory **76** (**FIG. 2**) program schedule information for programs meeting the active selection criterion. The retrieved programs are sorted in accordance with the active sort attribute at step **824**. At step **826**, the selected programs are displayed in the appropriate order in the program menu **206** (**FIG. 7**) on the display **84** (**FIG. 2**). The control unit **74** (**FIG. 2**) also causes the display **84** (**FIG. 2**) to display the total number of programs found and the group headers in the program menu **206** (**FIG. 2**).

[0169] At test **828**, the control unit **74** (**FIG. 2**) checks if the viewer pressed the Left or Right Arrow key on the remote control **78** (**FIG. 2**). If not, the control unit **74** (**FIG. 2**) proceeds to step **832**. Otherwise, the control unit **74** (**FIG. 2**) first sets the active menu to the menu chosen by the viewer (either the select menu **202** (**FIG. 7**), the sort menu **204** (**FIG. 7**), or the program menu **206** (**FIG. 7**)) at step **830** before proceeding to step **832**. At step **832**, the control unit **74** (**FIG. 2**) causes the display **84** (**FIG. 2**) to display a cursor in the active menu.

[0170] At test **834**, the control unit **74** (**FIG. 2**) checks if the viewer pressed the Up or Down Arrow key on the remote control **78** (**FIG. 2**). If not, the control unit **74** (**FIG. 2**) proceeds to step **836**. However, if one of these keys was pressed, the result depends on which menu is currently active. If the control unit **74** (**FIG. 2**) determines at test **838** that the select menu **202** (**FIG. 7**) is active, steps **840** and **842** are performed to scroll the select menu **202** (**FIG. 7**) in the appropriate direction, and to set the active selection criterion to the selection criterion displayed in the active selection criterion cell **208** (**FIG. 7**) after scrolling. If the

control unit **74** (**FIG. 2**) determines at test **844** that the sort menu **204** (**FIG. 7**) is active, steps **846** and **848** are performed to scroll the sort menu **204** (**FIG. 7**) in the appropriate direction, and to set the active sort attribute to the sort attribute displayed in the active sort attribute cell **214** (**FIG. 7**) after scrolling.

[**0171**] If the control unit **74** (**FIG. 2**) determines at test **850** that the program menu **206** (**FIG. 2**) is active, test **852** is performed to determine if the next program in the direction indicated by the key pressed by the viewer is currently displayed in the program menu **206** (**FIG. 7**). If it is, the cursor is moved to the next program at step **854**. Otherwise, the program menu **206** (**FIG. 7**) is first scrolled before step **854** is performed.

[**0172**] At step **836**, the control unit **74** (**FIG. 2**) sets a pointer to the program that was most recently highlighted in the program menu **206** (**FIG. 7**). At test **858**, the control unit **74** (**FIG. 2**) checks if the viewer pressed Select key on the remote control **78** (**FIG. 2**). If not, the control unit **74** (**FIG. 2**) proceeds to test **862**. Otherwise, test **862** is performed to determine if the program menu **206** (**FIG. 2**) is the active menu. If it is not, the control unit **74** (**FIG. 2**) proceeds to test **860**. Otherwise, control is passed to the Selection routine (FIGS. **16-18**) at step **864**.

[**0173**] At test **860**, the control unit **74** (**FIG. 2**) checks if the viewer pressed the Menu key on the remote control **78** (**FIG. 2**). If not, the control unit **74** (**FIG. 2**) loops back to step **816**. Otherwise, control passes to the Quickmenu routine (FIGS. **14-15**) at step **866** before the control unit **74** (**FIG. 2**) loops back to step **816**.

[**0174**] **FIGS. 22 and 23** represent the Day to View routine **866**. At step **868**, control unit **74** (**FIG. 2**) causes the display **84** (**FIG. 2**) to display the calendar menu **302** (**FIG. 8**) for the current month on the screen **300** (**FIG. 8**). At step **870**, the calendar cells corresponding to dates for which program schedule information is available in the memory **76** (**FIG. 2**) are highlighted. At step **872**, the control unit **74** (**FIG. 2**) causes the display **84** (**FIG. 2**) to display the day part menu **304**. At step **874**, the calendar cursor is placed on the calendar cell corresponding to the current date. At step **876**, the day part cursor is placed on the day part cell corresponding to the current day part.

[**0175**] The control unit **74** (**FIG. 2**) then proceeds to perform a series of tests determine if the viewer pressed the Right, Left, Down, or Up Arrow Key. If the control unit **74** (**FIG. 2**) determines at test **878** that the Right Arrow key was pressed, test **880** is performed to determine if the next calendar cell to be highlighted is currently displayed. If it is, the cursor is moved to the next calendar cell at step **882**. If not, the control unit **74** (**FIG. 2**) causes the calendar menu **302** (**FIG. 8**) to advance to the next month at step **884** before step **882** is performed.

[**0176**] If the control unit **74** (**FIG. 2**) determines at test **886** that the Left Arrow key was pressed, test **888** is performed to determine if the previous calendar cell is currently displayed. If it is, the cursor is moved to the previous calendar cell at step **890**. If not, the control unit **74** (**FIG. 2**) causes the display **84** (**FIG. 2**) to display the previous month in the calendar menu **302** (**FIG. 8**) at step **892** before step **890** is performed.

[**0177**] If the control unit **74** (**FIG. 2**) determines at test **894** that the viewer pressed the Down Arrow key, the day part cursor is moved to the next day part displayed in the day part menu **304** (**FIG. 8**) at step **896**. If the control unit **74** (**FIG. 2**) determines at test **898** that the viewer pressed the Up Arrow key, the day part cursor is moved to the previous day part displayed in the day part menu **304** (**FIG. 8**) at step **900**. It should be noted that both the calendar menu **302** (**FIG. 8**) and the day part menu **304** (**FIG. 8**) preferably operate in an endless loop fashion. Thus, if the viewer tries to advance the cursor beyond the last choice in either of the menus, the cursor wraps to the first choice. The same principle applies in the reverse direction as well.

[**0178**] At step **902**, the control unit **74** (**FIG. 2**) sets a pointer to the date and day part selected by the viewer (i.e., the highlighted choices). At test **904**, the control unit **74** (**FIG. 2**) checks if the viewer pressed the Select key. If the Select key was pressed, control is passed to the Program Guide routine (FIGS. **12-13**) at step **906**. If not, at test **908**, the control unit **74** (**FIG. 2**) checks if the viewer pressed the Menu key. If the Menu key was pressed, the Quickmenu routine (FIGS. **14-15**) is invoked at step **910**. If not, or if the viewer chooses to leave the quickmenu **116** (**FIG. 3**), the control unit **74** (**FIG. 2**) loops back to the test **878**.

[**0179**] FIGS. **24-28** represent the Favorite Channel routine **912**. At step **914**, the control unit **74** (**FIG. 2**) causes the display **84** (**FIG. 2**) to display the full line-up menu **402** (**FIG. 9**). At step **916**, the menu **402** (**FIG. 9**) is designated as active. At step **918**, the control unit **74** (**FIG. 2**) retrieves the viewer's favorite channel line-up from the memory **76** (**FIG. 2**), if one exists. The favorite channel menu **404** (**FIG. 9**), is displayed on the display **84** (**FIG. 9**) at step **920**. At step **922**, the select icon **414** (**FIG. 9**) is displayed.

[**0180**] At test **924**, the control unit **74** (**FIG. 2**) checks if the viewer pressed the Left or Right Arrow key. If not, the cursor is displayed in the active menu at step **926**. Otherwise, the active menu is set to the menu chosen by the viewer (i.e., the full line-up menu **402** (**FIG. 9**), the favorite channel menu **404** (**FIG. 9**), or the select icon **414** (**FIG. 9**)) at step **928** before step **926** is performed.

[**0181**] At test **930**, the control unit **74** (**FIG. 2**) checks if the viewer pressed the Up or Down Arrow key. If not, the control unit **74** (**FIG. 2**) proceeds to test **932**. Otherwise, tests **934** and **942** are performed. At test **934**, the control unit **74** (**FIG. 2**) determines if the full line-up menu **402** (**FIG. 9**) is active. If it is, test **936** is performed to determine if the next channel to be highlighted in the full line-up menu **402** (**FIG. 9**) is currently displayed. If it is, at step **938**, the cursor is moved to the next channel in the full line-up menu **402** (**FIG. 9**) as indicated by key pressed by the viewer. Otherwise, step **940** is first performed to scroll the full line-up menu **402** (**FIG. 9**).

[**0182**] At test **942**, the control unit **74** (**FIG. 2**) determines if the favorite channel menu **404** (**FIG. 9**) is active. If it is, test **944** is performed to determine if the next channel to be highlighted in the favorite channel menu **404** (**FIG. 9**) is currently displayed. If it is, at step **946**, the cursor is moved to the next channel in the favorite channel menu **404** (**FIG. 9**) as indicated by the key pressed by the viewer. Otherwise, step **948** is first performed to scroll the favorite channel menu **404** (**FIG. 9**).

[**0183**] At test **932**, the control unit **74** (**FIG. 2**) checks if the viewer pressed the Select key. If not, the control unit **74**

(**FIG. 2**) then checks if the viewer pressed the Menu key at test **950**. If not, the control unit **74** (**FIG. 2**) loops back to test **924**. If the Menu key was pressed, the Quickmenu routine (FIGS. **14-15**) is invoked at step **952**. If the viewer then leaves the quickmenu **116** (**FIG. 3**) without making a selection, the control unit **74** (**FIG. 2**) then loops back to the step **924**.

[**0184**] If the control unit **74** (**FIG. 2**) determines that the viewer pressed the Select key at test **932**, test **954** is performed to determine if the full line-up menu **402** (**FIG. 9**) is active. If it is, the control unit **74** (**FIG. 2**) sets a pointer to the highlighted channel at step **956**. Test **958** is then performed to determine if the first opening in the favorite channel menu **404** (**FIG. 9**) is currently displayed. If it is, at step **960**, the cursor is moved to the first open cell in the favorite channel menu **404** (**FIG. 9**). Otherwise, step **962** is first performed to scroll the favorite channel menu **404** (**FIG. 9**) by an amount sufficient to display the first open cell. At step **964**, the channel referenced by the pointer set at step **956** is displayed in the highlighted cell of the favorite channel menu **404** (**FIG. 9**).

[**0185**] At test **966**, the control unit **74** (**FIG. 2**) again checks if the viewer pressed the Select key. If not, test **968** is performed to check if the viewer pressed the Up or Down Arrow key. If not, the control unit **74** (**FIG. 2**) loops back to the test **966** to wait for the viewer to press either the Select, Up Arrow, or Down Arrow key. If the viewer pressed the Up or Down Arrow key, test **970** is performed to determine if the next opening in the favorite channel menu **404** (**FIG. 9**) is currently displayed. If it is, at step **972**, the cursor is moved to the next opening in the favorite channel menu **404** (**FIG. 9**) as indicated by the key pressed by the viewer. Otherwise, step **974** is first performed to scroll the favorite channel menu **404** (**FIG. 9**) by an amount sufficient to display the next opening. After step **972**, the control unit **74** (**FIG. 2**) loops back to step **964**.

[**0186**] If the control unit **74** (**FIG. 2**) determines at test **966** that the viewer pressed the Select key, the channel highlighted in the favorite channel menu **404** (**FIG. 9**) is temporarily inserted into the viewer's favorite channel line-up at step **976**. At step **978**, the previous contents of the favorite channel menu **404** (**FIG. 9**) is replaced with the new temporary favorite channel line-up. At step **980**, the cursor is returned to the full line-up menu **402** (**FIG. 9**). The control unit **74** (**FIG. 2**) then loops back to test **924**.

[**0187**] If the control unit **74** (**FIG. 2**) determines at test **954** that the full line-up menu **402** (**FIG. 9**) is not active, test **982** is performed to determine if the favorite channel menu **404** (**FIG. 9**) is active. If it is, the channel highlighted in the favorite channel menu **404** (**FIG. 9**) is temporarily deleted from the viewer's favorite channel line-up at step **984**. At step **986**, the contents of the favorite channel menu **404** (**FIG. 9**) is replaced with the new temporary favorite channel line-up, with an opening being left in the cell previously occupied by the recently deleted favorite channel.

[**0188**] If the control unit **74** (**FIG. 2**) determines at test **982** that the favorite channel menu **404** (**FIG. 9**) is not active, test **988** is performed to determine if the select icon **414** (**FIG. 9**) is active. If it is, the temporary favorite channel line-up is stored for future use in the memory **76** (**FIG. 2**) at step **990**. Otherwise, the control unit **74** (**FIG. 2**) loops back to test **924**.

[**0189**] Thus it is seen that interactive television program guide systems and related processes are provided that include an intuitive search utility for allowing a viewer to locate programs of interest by applying a restrictive search selection criterion and a nonrestrictive sort attribute to program schedule information. One skilled in the art will appreciate that the present invention can be practiced by other than the described embodiments, which are presented for purposes of illustration and not of limitation, and the present invention is limited only by the claims which follow.

What is claimed is:

1. An interactive program guide system for allowing viewer selection of television programs from selected program schedule information displayed on a display, the system comprising:

tuning circuitry for receiving as input, television signals corresponding to a plurality of television channels and for providing an output television signal corresponding to a selected one of said channels;

memory for storing program schedule information;

a user input device for providing user inputs including a restrictive program selection criterion, a nonrestrictive program sort attribute, and a program choice; and

a control unit for (a) receiving said user inputs, (b) selecting from said memory, program schedule information meeting said restrictive program selection criterion for display on said display, (c) causing said display to display said selected program schedule information in an order prescribed by said nonrestrictive program sort attribute, and (d) causing said tuning circuitry to provide said output television signal in accordance with said program choice made from said selected program schedule information.

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