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(54) **SATELLITE SIGNAL LOSS ON-SCREEN NOTIFICATION**

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(57) **ABSTRACT**

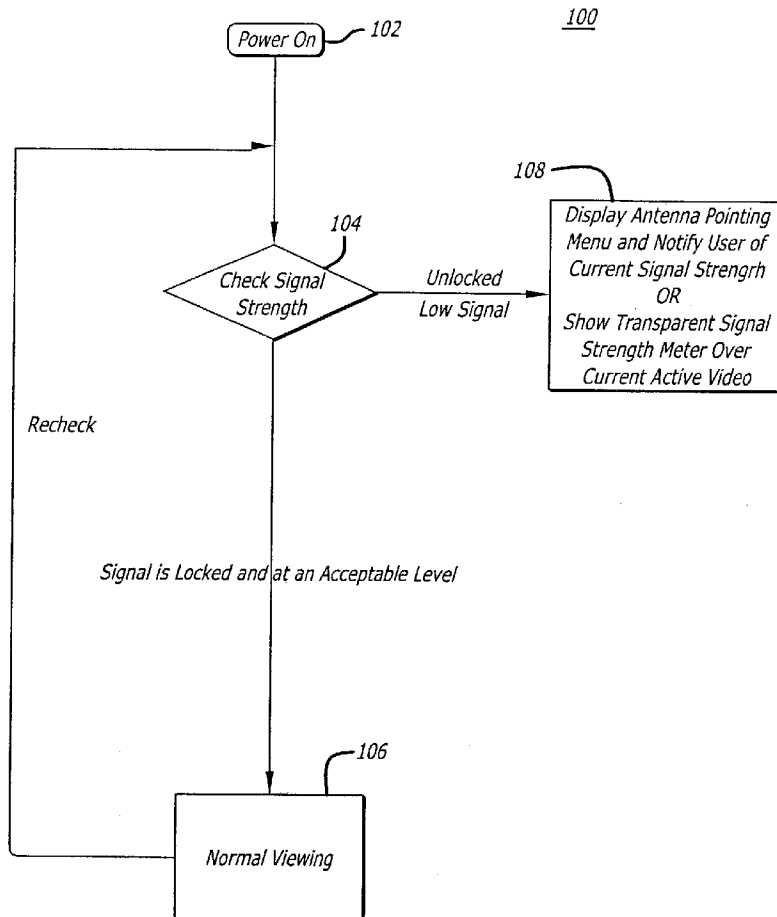
An apparatus for displaying a received signal strength includes means for detecting a received signal strength of a signal received at an antenna. Coupled to the detecting means are means for automatically generating a display signal indicative of the received signal strength. The means for generating is configured to provide the display signal whenever the received signal strength is below a preset threshold. Coupled to the means for generating the display signal are means for displaying the display signal. The display signal may comprise a bar graph which is shaded according to the received signal strength. The bar graph is automatically displayed on the display means when the received signal strength is below the threshold.

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Related U.S. Application Data

(63) Continuation of application No. 08/811,827, filed on Mar. 5, 1997, now Pat. No. 6,580,452.



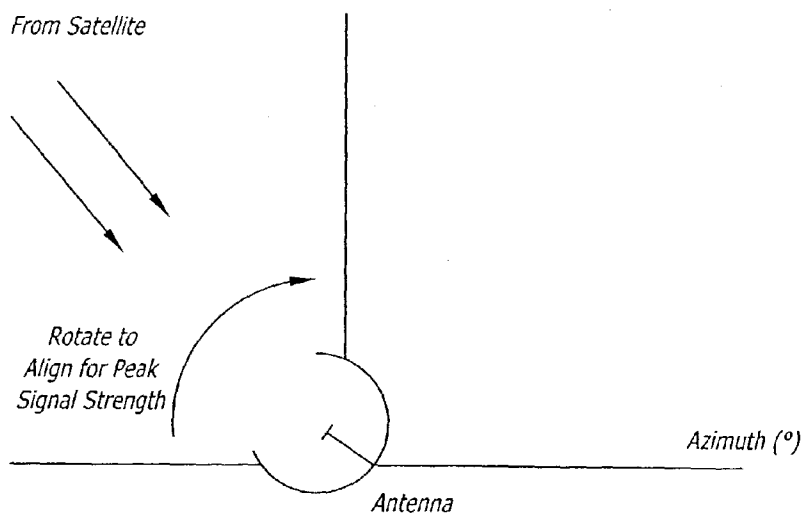


FIG. 1

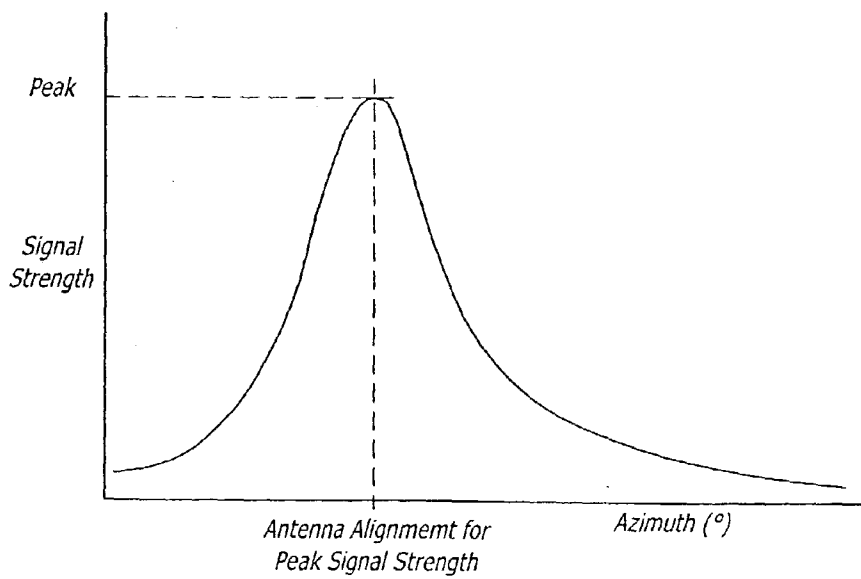


FIG. 2

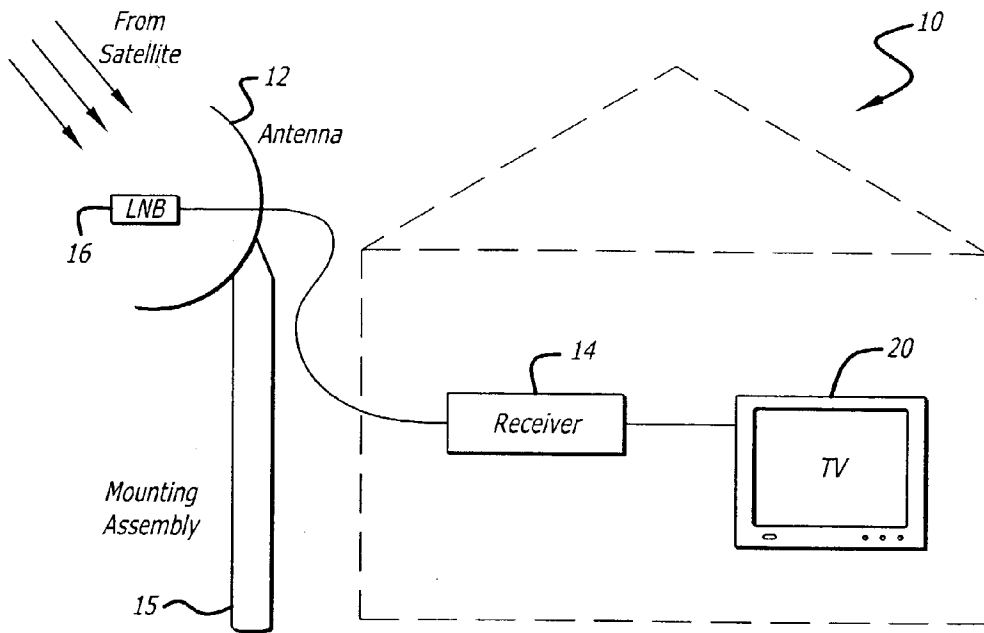


FIG. 3

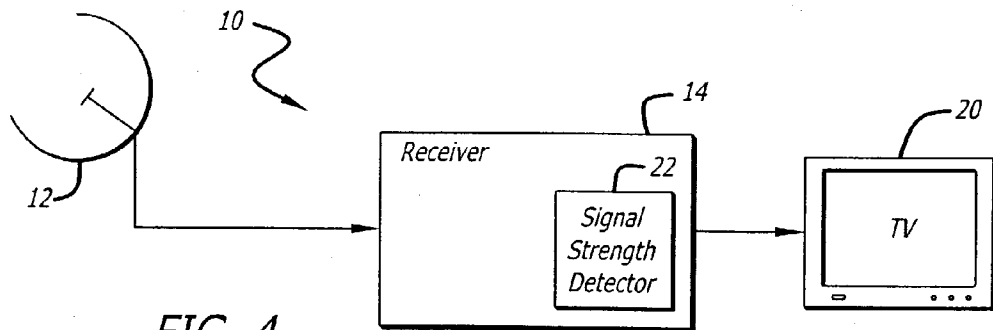


FIG. 4

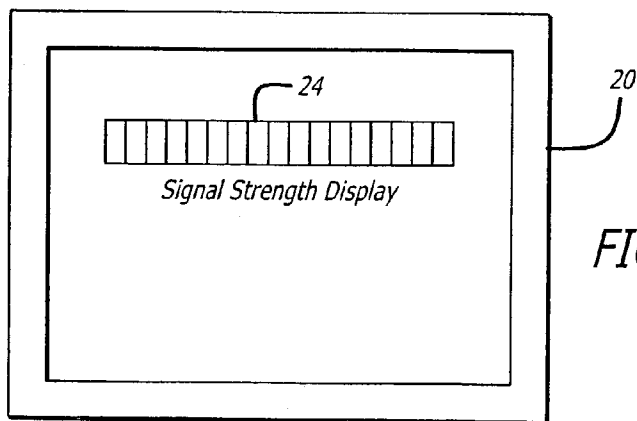


FIG. 5

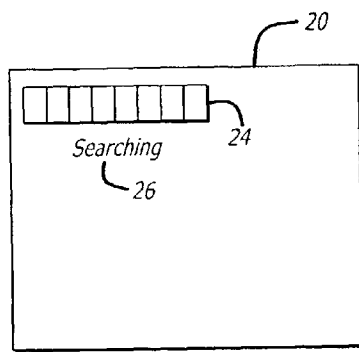


FIG. 6a

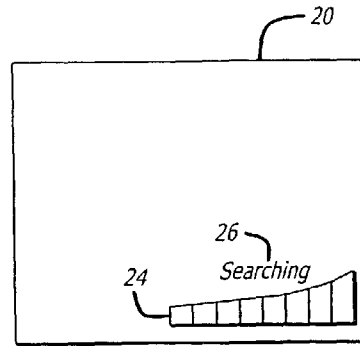


FIG. 6b

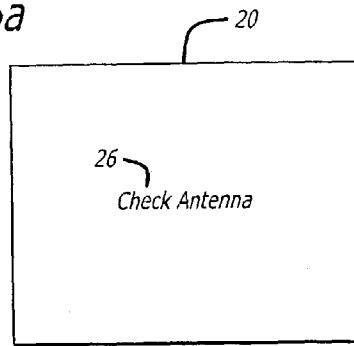


FIG. 6c

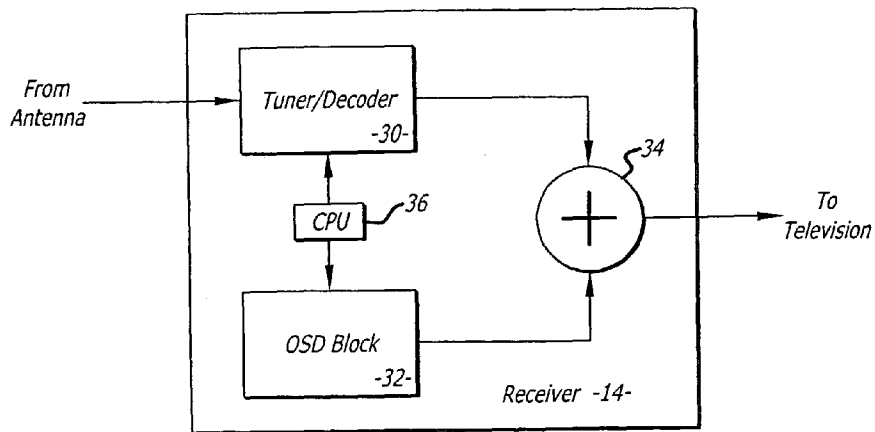


FIG. 7

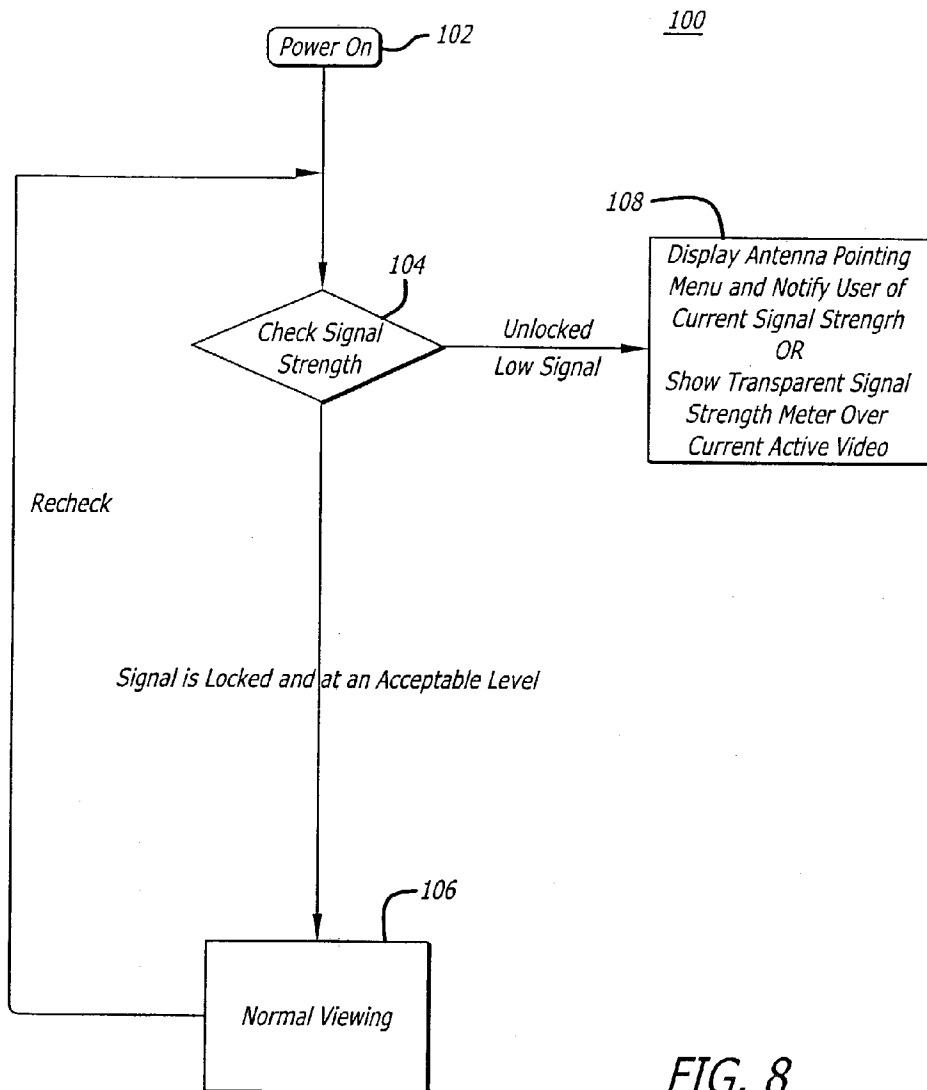


FIG. 8

SATELLITE SIGNAL LOSS ON-SCREEN NOTIFICATION

FIELD OF THE INVENTION

[0001] The present invention is related to home satellite receiving systems and, more particularly, to those systems which provide graphical or other on-screen indications or messages for users of such systems.

BACKGROUND

[0002] With the advent of direct broadcast satellite receiver systems in the home, proper alignment of a receiving antenna for operation of such receivers has become a concern. **FIG. 1** illustrates the basic alignment problem facing the user of a home satellite receiver. An antenna associated with the receiving system must be aligned in azimuth so as to receive a signal broadcast by the satellite. Typically, this alignment is performed by a user who rotates the antenna in azimuth until receiving an indication that an acceptable signal strength is presented to the receiver system. As shown in **FIG. 2**, as the antenna is rotated in azimuth, there will come a time at which a peak signal strength for a received signal presented from the antenna to the receiver system is achieved. As the antenna is rotated further in azimuth, the signal strength falls off according to the degree of misalignment.

[0003] Optimally, a user will adjust the antenna for the home satellite receiving system so that the antenna points in a direction coincident with the peak signal strength. Current home receiver systems employ on-screen indicators, for example bar graphs, to assist in the alignment process. The bar graphs are shaded by an amount proportional to the received signal strength. Accordingly, the user adjusts the alignment of the antenna until the bar graph indicates optimal alignment. The bar graph display may also be used during reception to indicate a current received signal strength. Typically, however, a user must access the bar graph signal strength display through a series of on-screen menu options.

[0004] Other home satellite receiver system manufacturers have implemented similar signal strength meters which provide some visual indication of the received signal strength. These systems generally have the same short comings as the bar graph approach, namely that the signal strength meter or other visual display reference must be accessed through a series of menu options. In many cases this is impractical, because when a user first sets up a home satellite receiving system the user is not familiar with the menu options and must refer to an operator's manual for assistance. Thus, before the user can begin alignment of the antenna system, the user must read an often lengthy manual to learn how to display the signal strength indicator on an associated television set. Even after the initial installation, the user must execute a series of menu options to display the signal strength indicator, for example when picture quality has a degraded appearance.

[0005] It would be desirable, therefore, to provide an improved means for displaying received signal strength for a home satellite receiver system.

SUMMARY OF THE INVENTION

[0006] In one embodiment, the present invention provides an apparatus for displaying a received signal strength. The

apparatus includes means for detecting a received signal strength of a signal received at an antenna. Coupled to the detecting means are means for automatically generating a display signal indicative of the received signal strength. The means for generating is configured to provide the display signal whenever the received signal strength is below a preset threshold. Coupled to the means for generating the display signal are means for displaying the display signal. The display signal may comprise a bar graph which is shaded according to the received signal strength. The bar graph is automatically displayed on the display means when the received signal strength is below the threshold.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] The present invention is illustrated by way of example, and not limitation, in the figures of the accompanying drawings in which:

[0008] **FIG. 1** illustrates the alignment of an antenna in azimuth;

[0009] **FIG. 2** illustrates a plot of received signal strength verses antenna position in azimuth;

[0010] **FIG. 3** illustrates a home satellite receiver system employing a signal strength detector and indicator according to one embodiment;

[0011] **FIG. 4** illustrates one embodiment of a signal strength detector and indicator;

[0012] **FIG. 5** illustrates the one possible signal strength display for use according to the present invention;

[0013] **FIGS. 6a, 6b and 6c** illustrate various signal strength displays for use according to the present invention;

[0014] **FIG. 7** illustrates a home satellite receiver configured according to one embodiment; and

[0015] **FIG. 8** is a flow diagram illustrating a signal strength display routine according to one embodiment.

DETAILED DESCRIPTION

[0016] A method and apparatus for automatically displaying a received signal strength is described. Although described with reference to certain specific embodiments, those skilled in the art will recognize that the present invention may be practiced without some or all of these details and, further, that the invention may be used in systems (such as direction finding aids) other than the home satellite television receiving system discussed below. The present invention improves the manner in which a user is notified of variations in received signal strength and/or a loss of received signal. In particular, in response to a variation in received signal strength, an on-screen signal strength indicator is automatically displayed. A user need not execute a series of menu options in order to access the signal strength indicator. In addition, in one embodiment, a signal strength indicator is automatically displayed if a home satellite television receiver recognizes that it is being activated for the first time.

[0017] **FIG. 3** illustrates a home satellite receiver system 10 which includes an antenna 12 coupled to a receiver 14. Antenna 12 is to be aligned so as to receive a signal broadcast by a satellite. When antenna 12 is aligned in an optimal position, the signal presented to receiver 14 from

antenna **12** will have a maximum received signal strength. Antenna **12** is maintained in alignment through the use of mounting assembly **15** which may comprise a bracket fixed to a wall or other supporting structure or a pole fixed in the ground or another stable platform (e.g., a roof).

[0018] Receiver system **10** also incorporates a low noise Block Down Converter (LNB) **16**. LNB **16** may be positioned near a feedhorn assembly (not shown) associated with antenna **12**. Signals received by antenna **12** are focused to the feedhorn and passed to LNB **16** where they are amplified and downconverted prior to transmission to receiver **14**. Such signals generally include audio and/or video information which is decoded by receiver **14**. The decoded audio and/or video information is then presented to television (TV) **20** for display.

[0019] As illustrated in FIG. 4, receiver **14** may include a signal strength detector **22**. Signal strength detector **22** is configured to sample the received signal presented from antenna **12** and determine a relative signal strength. Techniques for computing a signal strength are well known in the art and typically involve the computation of a time averaged measure of the magnitude of the received signal. In other embodiments, the signal strength detector **22** may be part of LNB **16** or may comprise a stand alone unit. Signal strength detector **22** generates a signal indicative of the relative strength of the received signal for later use.

[0020] FIG. 5 shows one possible means of displaying the signal strength information generated by signal strength detector **22**. In this example, the signal strength information is displayed as a bar graph on TV **20**. It will be appreciated that in such an embodiment, the signal strength detector **22** generates a signal indicative of the received signal strength and that signal is subsequently converted to video information for display on TV **20**. The video information is displayed as bar graph **24** at an appropriate location on TV **20** so as to provide a user with a visual representation of the received signal strength. During times when the received signal strength is relatively strong, bar graph **24** may be predominately lit. That is, more of the individual bars are shaded (e.g., with one or more colors) than are not shaded. As signal strength falls off (for example, as might occur during periods of increased solar activity, rain, snow, or during antenna alignment), fewer individual bars of the graph **24** will be lit. In this way, bar graph **24** may be used as a ready reference for indicating the relative received signal strength.

[0021] It should be recognized that bar graph **24** is merely one of a number of possible video presentations of the received signal strength which might be implemented. In other embodiments, bar graph **24** may be replaced by a display showing a number. Higher numbers may be used to indicate relatively strong signal strength while smaller numbers may be used to indicate weaker signal strength. In yet other embodiments, other indicators of relative received signal strength may be used. Accordingly, bar graph **24** is used merely to illustrate the principle of displaying a visual indicator for a user and should in no way limit the present invention.

[0022] As discussed above, as antenna **12** is moved in azimuth, a peak signal strength may be found and reported by signal strength detector **22**. At such times, bar graph **24** may be completely (or nearly completely) lit. As antenna **12**

continues to be rotated in azimuth, received signal strength falls off from the peak and signal strength detector **22** reports the weaker signal strength. As a result, bar graph **24** will become predominantly unlit, indicating that the user has rotated the antenna beyond the position which provided maximum received signal strength.

[0023] Generally, signal strength displays such as bar graph **24** can only be accessed by users after executing a series of on-screen menu commands or after manipulation of one or more front panel controls. During the initial set up process of a home satellite television receiver system, this can be troublesome to an inexperienced user. Accordingly, the present invention provides that when receiver system **10** is being installed for the first time, bar graph **24** will be automatically displayed. In this way, a user will be provided with an immediate indication of the relative strength of the received signal to assist in properly aligning antenna **12**.

[0024] In addition to being automatically displayed at initial set-up, bar graph **24** will also be automatically displayed whenever the received signal strength falls below an acceptable level to provide audio and/or video images to TV **20**. Generally, when the received signal strength falls below an acceptable level, the video image displayed on TV **20** will freeze. If the signal strength returns to an acceptable level, the image will return to normal. With prior receiver systems, users were not automatically provided with any indication of why a video image suddenly froze on the screen of their television. As noted above, the cause could be any number of situations, including a severed cable between an antenna and a receiver, rain or other inclement weather, sun spot activity or transmission problems originating at the satellite or the uplink station. In such systems, a user is forced to execute a series of menu commands (or push button commands) to display a signal strength indication which may help resolve the source of the problem. (For example, if a signal strength of zero were indicated, this may indicate that a cable break between the receiver and the antenna has occurred.)

[0025] In order to provide a user with a visual indication of why a video image has suddenly frozen on the screen, the present invention provides that bar graph **24** (or another visual indicator) will be automatically displayed on TV **20** whenever the received signal strength has fallen below an acceptable level. The acceptable level for viewing may be preset or may be later programmed by a user. Generally, however, the signal level at which the bar graph **24** will be automatically displayed will be the same level at which the video image will freeze.

[0026] The bar graph **24** is generated in the same fashion as described above and may be superimposed over the frozen video image using video mixing techniques well known in the art. Alternatively, the bar graph **24** display may replace the frozen video image on the screen of TV **20**. As illustrated in FIGS. 6a-6c, a variety of display options may be used. FIG. 6a shows one option where bar graph **24** is displayed in a corner of the TV **20** screen, preferably superimposed over a frozen video image. Notice further that along with bar graph **24**, a text message **26** may be displayed. The text message **26** may alert the user as to the source of the problem. For example, if the receiver **14** still detects signals from antenna **14**, but the signals are below an acceptable level, the receiver **14** may recognize that a

connection still exists between it and antenna **14** and, thus, the problem is probably one of transmission (either due to weather conditions or some other factor). Thus, a text message **26** such as "Searching" may be displayed to indicate to the user that the receiver **14** is trying to acquire the satellite signal and that the problem does not exist with the user's antenna to receiver connection.

[0027] FIG. 6b illustrates an alternative display situation. In this case, bar graph **24** has a stylized appearance, with larger bar sections for use in indicating stronger received signal strength. As shown, this bar graph **24** may be accompanied by a text message **26** as before.

[0028] FIG. 6c illustrates a further variation. This time only a text message **26** is displayed. Such a situation may be used for those times when the receiver **14** no longer detects any signals arriving from antenna **12**. This may indicate a problem with the user's receiver system **10** and so a text message **26** such as "Check Antenna" is displayed to alert the user that the problem may originate with his or her system **10**. In all cases, the bar graph **24** and/or text message **26** is displayed automatically in response to receiver **14** detecting a loss of received signal strength. The user is no longer required to search through a variety of menu options or push button commands in order to have the information displayed.

[0029] FIG. 7 illustrates one possible configuration of receiver **14**. Signals from antenna **12** are provided to a tuner/decoder block **30** within receiver **14**. Tuner/decoder **30** selects and decodes the desired portions of the signals provided by antenna **12** for processing into television signals (e.g., NTSC or PAL signals) for use by television **20**. The processed signals may be combined with on-screen display data produced by on-screen display (OSD) block **32** in a mixer **34**. The combined signals are then provided to TV **20**.

[0030] OSD block **32** generates on-screen display data such as bar graph **24** and text messages **26** using techniques common in the art. The on-screen display information may be provided in response to commands from a processor (CPU) **36** which also controls the actions of tuner/decoder block **30**. FIG. 8 illustrates one possible process to be executed by CPU **36** to control the display of on-screen information.

[0031] Process **100** begins at step **102** when power is supplied to receiver **14**. At step **104**, processor **36** performs the operations required to determine the relative signal strength of the signals received at receiver **14**. It should be appreciated that the functions of signal strength detector **22** may be provided by elements of tuner/decoder **30** or by separate circuitry. In general, however, such information may be reported to CPU **36** which may be a general purpose programmable microprocessor or, in some cases, a field programmable gate array or complex programmable logic device configured in accordance with process **100**. During ordinary operating conditions, the received signal will be at an acceptable level for viewing and process **100** will proceed to step **106** for normal viewing. The received signal strength is continuously checked and if it falls below an acceptable level (or if this is the first time receiver **14** is being set-up), process **100** will move to step **108** where the signal strength indication (e.g., bar graph **24**) will be displayed automatically. Note that the signal strength indication which is

displayed during initial set-up may contain additional antenna alignment information which is not generally displayed at other times.

[0032] Thus, a novel signal strength indicator system for a home satellite television receiver system has been disclosed. Although discussed with reference to specific embodiments and the accompanying illustrations, it should be appreciated that the present invention is applicable to a variety of signal strength and/or antenna alignment indicator systems. Accordingly, the invention should only be measured in terms of the claims which follow.

What is claimed is:

1. An apparatus for displaying a received signal strength, comprising:

means for detecting a received signal strength of a signal received at an antenna;

means for generating a display signal indicative of said received signal strength coupled to said means for detecting, said means for generating a display signal configured to provide a display signal when said received signal strength is below a threshold; and

means for automatically displaying said display signal coupled to said means for generating.

2. An apparatus as in claim 1 wherein said display signal comprises a bar graph.

3. An apparatus as in claim 1 wherein said display signal comprises a text message.

4. An apparatus as in claim 1 wherein said means for detecting comprises a satellite television receiver.

5. A method of operating a receiver system, comprising the steps of:

periodically determining a received signal strength of a signal received at said system; and

automatically displaying a signal strength indication when said received signal strength falls below a threshold.

6. A method as in claim 5 wherein said step of automatically displaying a signal strength indication comprises displaying said indication on a television set.

7. A method as in claim 6 wherein said signal strength indication comprises a bar graph.

8. A method as in claim 6 wherein said signal strength indication comprises a text message.

9. A method of aligning an antenna, comprising the steps of:

determining a first occasion upon which a receiver system is powered up; and

automatically providing an antenna alignment aid using a television.

10. A method as in claim 9 wherein said step of automatically providing an antenna alignment aid comprises displaying a signal strength indicator on said television, said signal strength indicator configured to provide a visual representation of a received signal strength at said antenna.

11. A method as in claim 10 wherein said visual representation comprises a bar graph.

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