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(54) **A METHOD AND A DEVICE FOR OPERATING AN LNB CONVERTER**

(57) A method for operating an LNB converter (120) connected to a signal receiving device (110), the method comprising: determining (301, 401) a location of the device (110) connected to the LNB converter (120); determining (501) a current outside temperature value for the determined location; comparing (502) the current outside temperature value with a threshold temperature; and delivering power (507) to the LNB (120) in case the current outside temperature is below the threshold temperature.

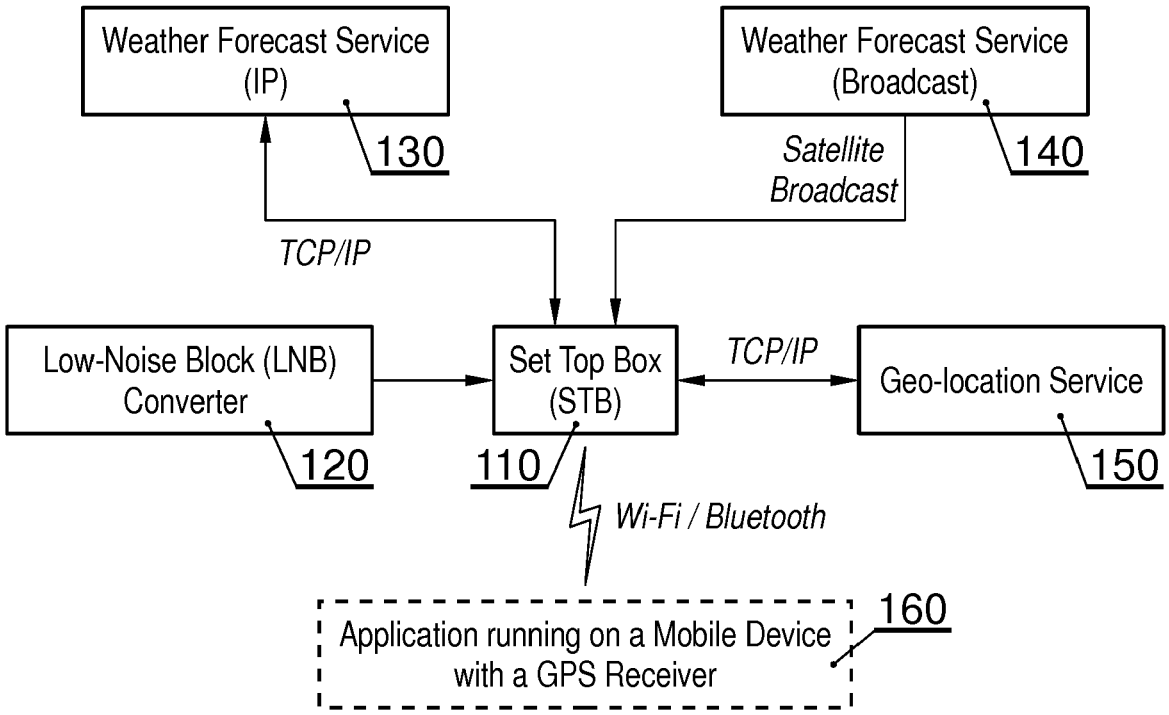

Fig. 1

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Description

TECHNICAL FIELD

[0001] The present disclosure relates to a method and a device for operating an LNB converter.

BACKGROUND

[0002] An LNB (Low-Noise Block) converter is an element mounted to a satellite dish, typically outdoors. In a typical single-house application, the LNB is connected through a coaxial cable with a satellite signal received, such as a STB (Set-Top-Box) to supply frequency down-converted satellite signal for further processing by the STB. On the other hand, the STB is responsible for supplying power to the LNB so that it can operate. In more complex solutions, a plurality of STBs may be connected to the LNB via a switch, and the power to the LNB may be provided by one of the STBs.

[0003] It may happen that when the LNB is not powered by any STB, for example because all STBs are turned off or have entered a passive standby mode or no recording nor data monitoring is on-going in the active standby mode. In such a case, if the outside temperature is low, the moisture collected at the LNB can freeze, causing ice to build-up and hence making the LNB casing leaky, which may lead to damage to the LNB components.

[0004] Therefore, there is a need to provide a method for controlling preventing the LNB converter from freezing to avoid subsequent damage.

SUMMARY

[0005] There is disclosed herein a method for operating an LNB converter connected to a signal receiving device, the method comprising: determining a location of the device connected to the LNB converter; determining a current outside temperature value for the determined location; comparing the current outside temperature value with a threshold temperature; and delivering power to the LNB in case the current outside temperature is below the threshold temperature.

[0006] The method may further comprise determining the location of the device from a geolocation service communicable via an Internet connection.

[0007] The method may further comprise determining the location of the device based on a GPS signal.

[0008] The method may further comprise determining the location of the device based on data entered manually by a user.

[0009] The method may further comprise, when the outside temperature value is higher than the threshold temperature and the LNB satellite signal is not used, disabling delivering power to the LNB.

[0010] The method may further comprise determining the current outside temperature value from a weather forecast service communicable via an Internet connection.

[0011] The method may further comprise determining the current outside temperature value from a weather forecast data broadcast in the satellite signal.

[0012] The method may further comprise determining the current outside temperature value based on the weather forecast data stored in the device.

[0013] There is also disclosed a signal receiving device connectable to an LNB converter and comprising a controller configured to perform the steps of the method as described herein.

BRIEF DESCRIPTION OF DRAWINGS

[0014] The method presented herein is presented by means of example embodiments on a drawing, wherein:

Fig. 1 presents a structure of a system;
Fig. 2 presents an example of a structure of a Set Top Box (STB);
Fig. 3 presents a process of determining an outside temperature performed at the STB connected to the Internet;
Fig. 4 presents steps of a method for determining an outside temperature performed at the STB which is not connected to the Internet;
Fig. 5 presents a flowchart of a method for controlling a temperature of an LNB converter.

NOTATION AND NOMENCLATURE

[0015] Some portions of the detailed description which follows are presented in terms of data processing procedures, steps or other symbolic representations of operations on data bits that can be performed on computer memory. Therefore, a computer executes such logical steps thus requiring physical manipulations of physical quantities.

[0016] Usually these quantities take the form of electrical or magnetic signals capable of being stored, transferred, combined, compared, and otherwise manipulated in a computer system. For reasons of common usage, these signals are referred to as bits, packets, messages, values, elements, symbols, characters, terms, numbers, or the like.

[0017] Additionally, all of these and similar terms are to be associated with the appropriate physical quantities and are merely convenient labels applied to these quantities. Terms such as "processing" or "creating" or "transferring" or "executing" or "determining" or "detecting" or "obtaining" or "selecting" or "calculating" or "generating" or the like, refer to the action and processes of a computer system that manipulates and transforms data represented as physical (electronic) quantities within the computer's registers and memories into other data similarly represented as physical quantities within the memories or registers or other such information storage.

[0018] A computer-readable (storage) medium, such as referred to herein, typically may be non-transitory and/or comprise a non-transitory device. In this context, a non-transitory storage medium may include a device that may be tangible, meaning that the device has a concrete physical form, although the device may change its physical state. Thus, for example, non-transitory refers to a device remaining tangible despite a change in state.

DETAILED DESCRIPTION

[0019] Fig. 1 presents a structure of a system. The system comprises a signal receiving device, such as a Set Top Box (STB) 110, which is connected to at least one LNB (Low-Noise Block down-converter) 120 (which does not need to have a temperature sensor).

[0020] For the LNB 120, information about current temperature and future weather broadcast is provided by a weather broadcast service 130, 140 which is either provided to the STB by a direct TCP/IP channel or a satellite broadcast. The system comprises also a connection to a geolocation service 150, for example based on a TCP/IP connection, in order to utilize the weather forecast data for the particular location wherein the STB is installed, provided by the geolocation service, determined by the IP address of the STB. Optionally, the system may comprise a mobile device 160 (for example a smartphone) with a GPS receiver with an application for providing the geolocation data. The mobile device 160 may be connected to the STB by Bluetooth or a Wi-Fi connection.

[0021] Fig. 2 presents an example of a structure of a Set Top Box (STB).

[0022] A controller 210 comprises a plurality of units configured to provide the functionality of the system as described herein in accordance with the method of Figs. 3-5.

[0023] An LNB control module 211 is responsible for controlling and powering the LNB converter mounted on a satellite dish.

[0024] A weather forecast monitoring unit 212 is responsible for receiving data from the weather forecast services.

[0025] A location unit 213 is responsible for receiving location data from the location services.

[0026] The STB 100 operates utilizing a memory block 240, including RAM, Flash and a hard disk drive (HDD) or another type of mass storage that can be used to store video or other data locally at the STB, but is not essential for its operation.

[0027] A clock module 270 is configured to provide timing data necessary for operation of the device units.

[0028] A data reception block 220 is configured to receive downstream data 202, such as video content, from the broadcasting distribution network. The data reception block 220 (also called a front-end block) may comprise a plurality of tuners (such as satellite, cable, terrestrial or IPTV tuners), wherein one of the tuners receives content to be displayed at the television screen to which the STB is directly connected (e.g. the STB 110 connected to a TV set) and another tuner receives content to be recorded at the HDD.

[0029] External interfaces 230, such as the Ethernet interface, are configured to communicate, via at least one transmission channel 203, with the Ethernet (IP) network or the wireless network, in order to receive necessary applications and/or other required data, as well as to communicate with mobile devices.

[0030] The STB is operable by the user via a remote control unit (RCU) that communicates, typically via an infrared (IR) receiver receiving an IR signal 205, with a RCU controller block 250.

[0031] An audio/video block 260 is an example of a content presentation block and is configured to decode the received content, convert it to an audio/video format suitable for presentation to the user, and transmit the converted content via a transmission channel 206 to the TV set to which the STB is directly connected.

[0032] All modules of the STB communicate with each other via one or more internal data buses 201.

[0033] Fig. 3 presents a process of determining an outside temperature performed on the STB connected (directly or indirectly) to the Internet. The STB 110 communicates in step 301 with the geolocation service 150 in order to obtain data concerning the location of the STB. The location obtained from the geolocation service can be determined basing on the STB IP address. Alternatively, the location may be determined by the accompanying application running on a mobile device equipped with a GPS receiver (a smart-phone) or may be introduced by a user in a GUI of the STB device. Next in step 302 the STB 110 communicates with the weather forecast service in order to receive the weather forecast for its current location. The weather forecast can be received by the STB from various sources. For example it can be received directly over an IP channel from a weather forecast provider (providing current outside temperature and the weather forecast) 130 or it can be broadcasted by a satellite operator 140 (which is particularly useful if the STB lacks IP connectivity). Optionally, the current outside temperature and the weather forecast can be provided to the STB, e.g. via wireless channel such as Bluetooth, by a mobile device (such as a smartphone) connected to the Internet (which is another particularly useful solution if the STB lacks IP connectivity). Next, in step 303, the value of the current temperature is updated and the weather forecast is stored in the STB in order to anticipate current outside temperature in future in case the weather forecast service would be not available at a later time.

[0034] Fig. 4 presents steps of a method for determination of an outside temperature performed at a STB that is not connected to the Internet. First, in step 401, the location of the STB is determined (in that case, it can be entered manually by the user in the STB menu). Next in step 402, a weather forecast for the STB location is retrieved from the weather forecast service broadcast by

the network operator in the satellite television signal. Next in step 403, the value of the current temperature is updated and the weather forecast data is stored in the STB in order to anticipate outside temperature in case of lack of the weather forecast data.

[0035] In case of lack of current temperature value due to non-availability of the weather forecast service, according to the stored weather forecast data, the LNB control module 211 can create a schedule for turning on and off the power of the LNB, to ensure that the LNB converter is powered on when the predicted outside temperature is below a threshold temperature value. The schedule is dynamically modified whenever the weather forecast is available and/or updated.

[0036] It is also possible for the scheduling algorithm of the system to utilize current date and time and the manually entered position of the STB to determine the value of the outside temperature basing on typical temperatures for a given region/location during a year (they can be provided, for instance, by the satellite operator). For instance, in case of Poland the LNB control module may require to keep the LNB being powered from the beginning of October to the end of March all the time, while being powered only at night (e.g. 8 pm - 8 am) in September, April and May, while it may be left non-powered in June, July and August (obviously, when the decoder software does not need the LNB at a given moment).

[0037] Fig. 5 presents a flowchart of a method for controlling a temperature of an LNB converter. First, in step 501, the current outside temperature value (i.e. the temperature outdoors to which the LNB is subject to) is received or is anticipated based on the stored weather forecast. Next, in step 502, it is checked if the outside temperature is below a specified threshold temperature. If not, then in step 503 it is checked if the LNB power is enabled. If not, the process loops back to the first step 501. Otherwise, in step 504 it is checked if the LNB is required to supply satellite data. It is checked by the STB software LNB control module, which receives information from other software modules, in particular from the tuner (front-end) to indicate if a given LNB is required to supply satellite data. If so, the process loops back to the first step. Otherwise, in step 505 the power of the LNB is being disabled and the process loops back to the first step 501. If in step 502 the outside temperature is determined to be lower than the specified threshold temperature, then in step 506 it is checked if the LNB power is enabled. If so, the process loops back to the first step 501. Otherwise, it continues to step 507, in which the LNB power is enabled, therefore the LNB heats up and the freezing of the moisture will be at least to some extent prevented. Next the process loops back to the first step 501.

[0038] The threshold temperature may be for example -3°C, 0°C or +3°C. The lower the threshold temperature, the more often the LNB will be powered on to heat it up, which will increase the LNB reliability, but decrease the power efficiency of the system.

[0039] The presented method and the system for controlling a temperature of an LNB converter allows to maintain the temperature inside the LNB module above a freezing point in order to prevent its damaging, in an energy saving manner, by powering the LNB module only when the outside temperature is below the specified threshold temperature. This prevents the LNB module to be permanently powered and also allows to control the powering of the LNB during user absence. The method and the system may cooperate with a standard LNB which does not need to be equipped with a temperature sensor.

[0040] At least parts of the methods according to the invention may be computer implemented. Accordingly, the present invention may take the form of an entirely hardware embodiment, an entirely software embodiment (including firmware, resident software, micro-code, etc.) or an embodiment combining software and hardware aspects that may all generally be referred to herein as a "circuit", "module" or "system".

[0041] Furthermore, the present invention may take the form of a computer program product embodied in any tangible medium of expression having computer usable program code embodied in the medium.

[0042] It can be easily recognized, by one skilled in the art, that the aforementioned method for controlling a temperature of an LNB converter may be performed and/or controlled by one or more computer programs. Such computer programs are typically executed by utilizing the computing resources in a computing device. Applications are stored on a non-transitory medium. An example of a non-transitory medium is a non-volatile memory, for example a flash memory while an example of a volatile memory is RAM. The computer instructions are executed by a processor. These memories are exemplary recording media for storing computer programs comprising computer-executable instructions performing all the steps of the computer-implemented method according the technical concept presented herein.

[0043] While the invention presented herein has been depicted, described, and has been defined with reference to particular preferred embodiments, such references and examples of implementation in the foregoing specification do not imply any limitation on the invention. It will, however, be evident that various modifications and changes may be made thereto without departing from the broader scope of the technical concept. The presented preferred embodiments are exemplary only, and are not exhaustive of the scope of the technical concept presented herein.

[0044] Accordingly, the scope of protection is not limited to the preferred embodiments described in the specification, but is only limited by the claims that follow.

Claims

1. A method for operating an LNB converter (120) con-

nected to a signal receiving device (110), the method comprising:

- determining (301, 401) a location of the device (110) connected to the LNB converter (120);
- determining (501) a current outside temperature value for the determined location;
- comparing (502) the current outside temperature value with a threshold temperature; and
- delivering power (507) to the LNB (120) in case the current outside temperature is below the threshold temperature.

2. The method according to claim 1, comprising determining (301) the location of the device (110) from a geolocation service communicable via an Internet connection.

3. The method according to claim 1, comprising determining (301) the location of the device (110) based on a GPS signal.

4. The method according to claim 1, comprising determining (301) the location of the device (110) based on data entered manually by a user.

5. The method according to any of previous claims, further comprising, when the outside temperature value is higher than the threshold temperature (502) and the LNB satellite signal is not used (504), disabling delivering power to the LNB (120).

6. The method according to any of previous claims, comprising determining (501) the current outside temperature value from a weather forecast service communicable via an Internet connection.

7. The method according to any of previous claims, comprising determining (501) the current outside temperature value from a weather forecast data broadcast in the satellite signal.

8. The method according to any of previous claims, comprising determining (501) the current outside temperature value based on the weather forecast data stored in the device.

9. A signal receiving device (110) connectable to an LNB converter (120) and comprising a controller (210) configured to perform the steps of the method of any of previous claims.

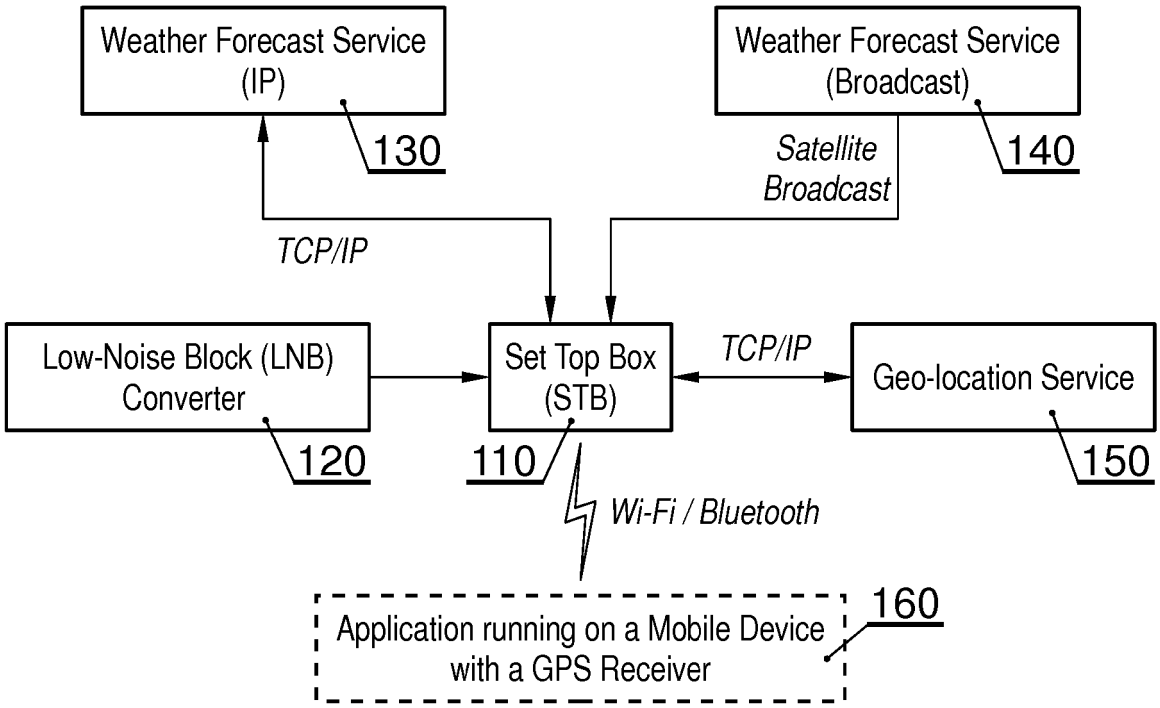
Weather Forecast Service (IP)
130
Weather Forecast Service (Broadcast)
140
Satellite Broadcast
TCP/IP
Low-Noise Block (LNB) Converter
120
Set Top Box (STB)
110
TCP/IP
Geo-location Service
150
Wi-Fi / Bluetooth
Application running on a Mobile Device with a GPS Receiver
160

Fig. 1

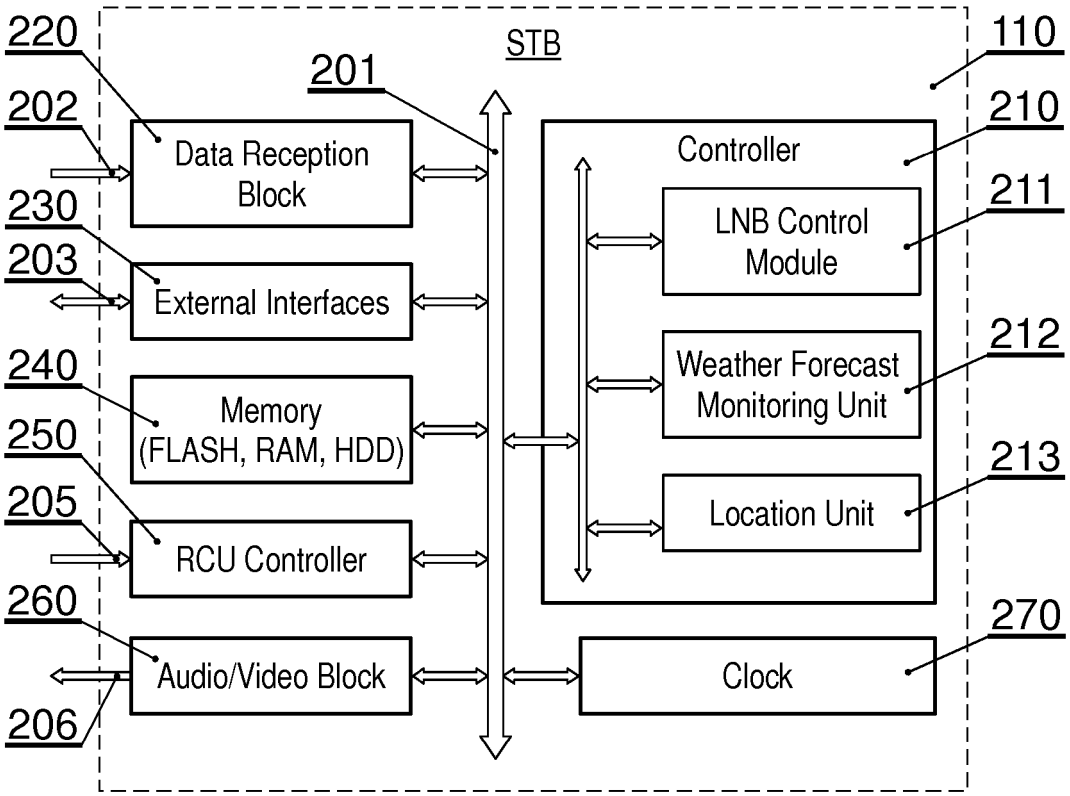
STB
110
201
220
202
230
203
240
250
205
260
206
Data Reception Block
External Interfaces
Memory (FLASH, RAM, HDD)
RCU Controller
Audio/Video Block
Controller
210
LNB Control Module
211
Weather Forecast Monitoring Unit
212
Location Unit
213
Clock
270

Fig. 2

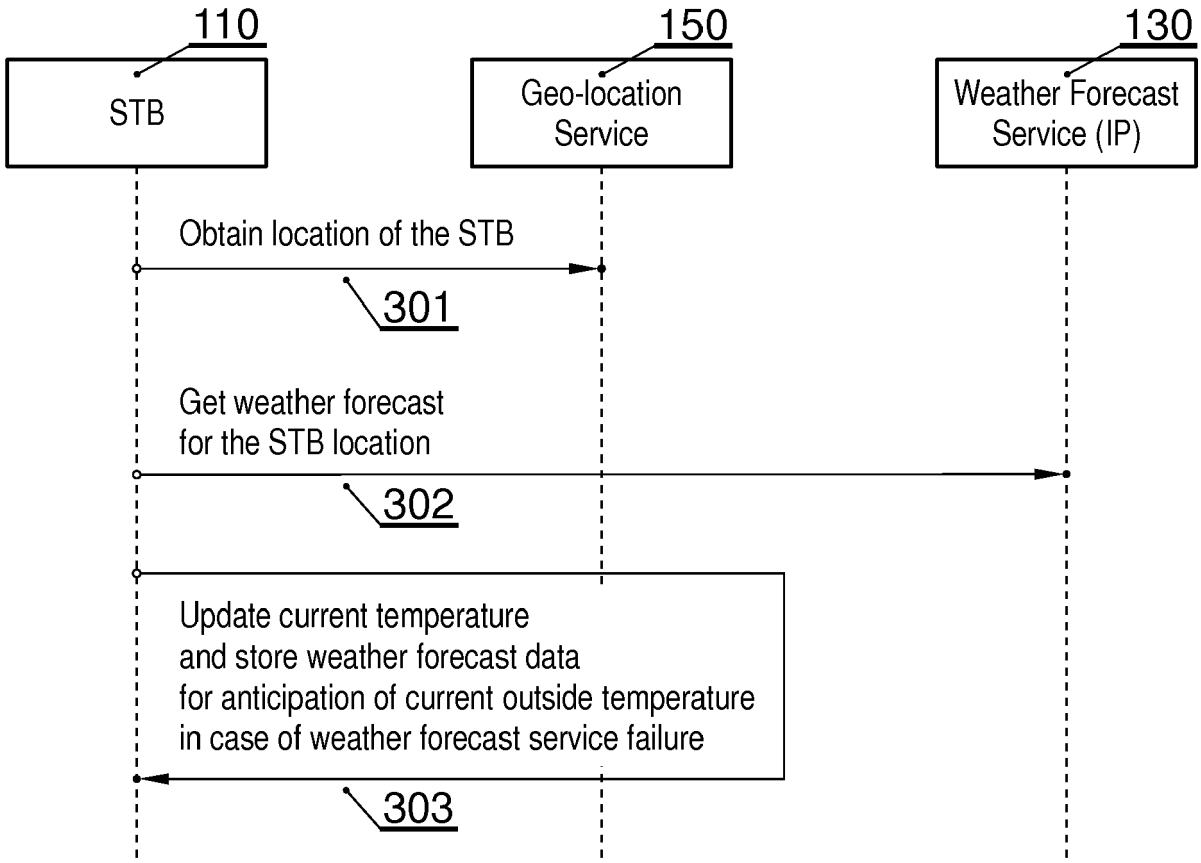
110
STB
150
Geo-location Service
130
Weather Forecast Service (IP)
Obtain location of the STB
301
Get weather forecast for the STB location
302
Update current temperature and store weather forecast data for anticipation of current outside temperature in case of weather forecast service failure
303

Fig. 3

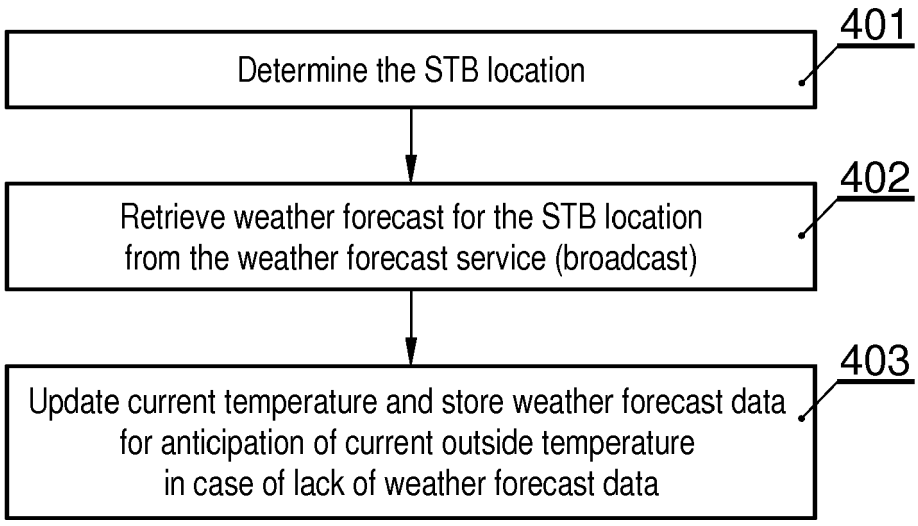
401
Determine the STB location
402
Retrieve weather forecast for the STB location from the weather forecast service (broadcast)
403
Update current temperature and store weather forecast data for anticipation of current outside temperature in case of lack of weather forecast data

Fig. 4

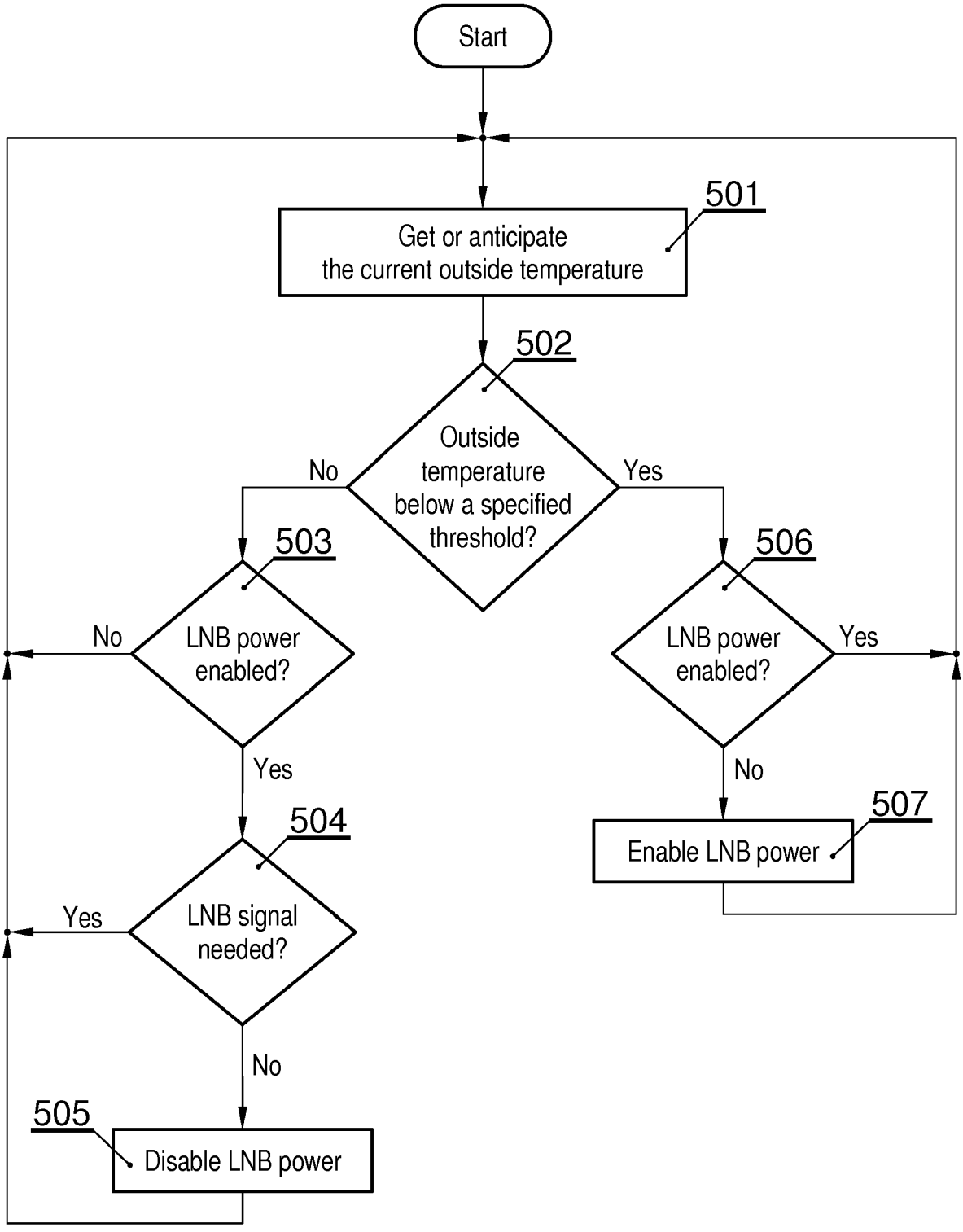
Start
501
Get or anticipate the current outside temperature
502
Outside temperature below a specified threshold?
No
Yes
503
LNB power enabled?
No
Yes
504
LNB signal needed?
Yes
No
505
Disable LNB power
506
LNB power enabled?
Yes
No
507
Enable LNB power

Fig. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 18 18 9958

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2011/273344 A1 (REAMS WILLIAM [US]) 10 November 2011 (2011-11-10) * paragraphs [0013], [0015] - [0016], [0020] - [0021], [0023], [0037], [0042], [0046], [0048]; figures 2-4 *	1-9	INV. H04H40/90 H01Q1/02
A	US 5 861 855 A (ARSENAULT ROBERT G [US] ET AL) 19 January 1999 (1999-01-19) * the whole document *	1-9	

TECHNICAL FIELDS SEARCHED (IPC)
H04H
H01Q

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	13 September 2018	Iovescu, Vladimir

CATEGORY OF CITED DOCUMENTS

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13-09-2018

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2011273344 A1	10-11-2011	NONE	
US 5861855 A	19-01-1999	NONE	

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