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(54) **Title of the Invention:** Teletext Broadcast Receiving System for Mobile Body

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SPECIFICATION

Title of the Invention: Teletext broadcast receiving system for mobile body

Claim

A teletext broadcast receiving system for a mobile body comprising, installed in a mobile body: a tuner for receiving television broadcasts; a teletext broadcast decoder that extracts and demodulates teletext data from a television broadcast signal received by said tuner; a memory that stores a plurality of frames' worth of the teletext data obtained by said teletext broadcast decoder; and a display means that displays the teletext broadcast data stored in said memory,

configured such that, when at least one frame's worth of teletext broadcast data for a required teletext broadcast program has been demodulated by said teletext broadcast decoder, this frame of teletext broadcast data obtained by demodulation is stored in the corresponding area of said memory and the stored data of said memory is updated.

Detailed Description of the Invention

[Field of Application in Industry]

The present invention relates to a teletext broadcast receiving system for a mobile body, preferably used in installations in mobile bodies such as electric trains.

[Summary of the Invention]

The present invention is a teletext broadcast receiving system for a mobile body that is installed in a mobile body such as an electric train, configured such that, when at least one frame's worth of teletext broadcast data for a required teletext broadcast program is demodulated by a teletext broadcast decoder, this frame of teletext broadcast data that has been obtained by demodulation is stored in a corresponding area of a memory, the stored data in the memory that stores the teletext broadcast data is updated, and thus, even when all of the data for the teletext broadcast program has not been received, good display of the teletext broadcast program is possible.

[Prior Art]

In recent years, services have been provided to passengers, in which television receivers have been installed in mobile bodies such as electric trains, and images that were played back by VTRs or the like have been received by these. In such cases, an antenna is attached to the roof of the electric train, television broadcast signals are received from ground-based transmitting stations by this antenna,

and images are received.

[Problems to be Solved by the Invention]

However, the ability to receive such television broadcast signals has been limited to times when locations with comparatively good radio wave conditions are traveled through. In other words, with mobile bodies traveling through areas with many obstacles such as buildings, as in cities, there are few locations where good reception is possible without undue interference with the broadcast signals from the transmitting stations, and thus reception status was very poor when a normal television antenna was just installed on a mobile body, such that the images were often in a state that was not good enough for practical use. For example, in the case of the Yamanote electric train line that runs roughly through the center of Tokyo, the distance from the transmitting stations is very short, and it is inherently an area with strong electric fields allowing for good reception, even with a simply structured antenna; but as there are very many obstacles such as buildings, it was nearly impossible to receive television signals with conventional technology without ghosting.

In addition, radio waves for teletext broadcasts were transmitted using a portion of the television broadcast signal, but since these signals for teletext broadcasts were converted into digital data tor transmission, it was impossible to receive the teletext broadcasts in moving bodies which are particularly sensitive to occurrences of ghosting.

It is an object or the present invention to make good reception of teletext broadcasts possible in moving bodies such as electric trains.

[Means for Solving the Problems]

As is shown, for example, in Fig. 1, the present invention comprises, installed in a mobile body (1): a tuner for receiving television broadcasts (43); a teletext broadcast decoder (46) that demodulates teletext broadcast data extracted from a television broadcast signal received by this tuner (43); a memory (47) that stores a plurality of frame's worth of the teletext broadcast data obtained by this teletext broadcast decoder (46); and display means (101), (102), (103) ... (124) that display that teletext broadcast data stored in this memory (47), configured such that when at least one frame's worth of teletext broadcast data for a required teletext broadcast program has been decoded by the teletext broadcast decoder (46), this teletext broadcast data that has been obtained by decoding is stored in a corresponding area of the memory (47) and the stored data in the memory (47) is updated.

[Operation]

With this configuration, if the data for all the frames of the required teletext broadcast program is initially stored in the memory, the data for the teletext broadcast program may be successively updated to the latest version, even if only the data for some of the frames of this teletext broadcast program can be received while the mobile body is traveling or the like, by updating only that portion of the data that could be received to the latest data; and because the data for all of the frames for the required teletext broadcast program is stored in the memory, display of all frames of the teletext broadcast program in question is always possible.

[Embodiment]

In the following, an embodiment of the present invention will be described with reference to Fig. 1 through Fig. 4.

In this example, a television receiver installed in an electric train is used in a receiving system that displays teletext broadcasts; therefore, the overall constitution of this receiving system will be described first.

In Fig. 1 and Fig. 2, (1) indicates a car body for an electric train; doors (entrances and exits) (11), (12), (13) ... (16) and (17), (18), (19) ... (22) are provided in six locations on each side, in the sides of this car body (1); and television receivers (101), (102), (103) ... (124) are installed above the left and right door pocket parts for each of the doors (11) through (22) inside the car. As is shown in Fig. 2, for example, television receivers (117) and (118) are attached to the upper part of the door pocket part on the left and right of the door (19). In this instance, the television receivers (101), (102), (103) ... (124) are thin, using liquid crystal panels or the like.

Furthermore, these television receivers (101), (102), (103) ... (124) display teletext broadcasts, and in order to receive these teletext broadcasts, four antennas (30a), (30b), (30c), (30d) are attached to the periphery of ventilators (3) and (4) on the rooftop (2) of the car body (1). In this instance, each of the antennas (30a), (30b), (30c), (30d)

has a dipole antenna configuration, comprising two conductor rods (31), (32), the ends of which are proximal, and a reflector (33) disposed with a prescribed gap from these conductor rods (31), (32); the gap part between the two conductor rods (31), (32) is connected to a coaxial cable (35) (see Fig. 3) via a balun (matching transformer), and this coaxial cable (35) is connected to a switch (41) inside an under-floor unit (40), which is described below. The length of the two conductor rods (31), (32) is selected according to the frequency of the channel received, and the reflector (33) is longer than the length of the two conductive rods (31), (32) together.

Furthermore, the mounting angles of the four antennas (30a), (30b), (30c), (30d) are offset 90° each in the horizontal direction; the antennas (30a), (30b) are mounted on the front and back (direction parallel to the rails) of the ventilator (3), and the antennas (30c), (30d) are attached to the left and right (direction perpendicular to the rails) of the ventilator (4) which is adjacent to the ventilator (3).

Describing the manner in which the antennas are mounted on the ventilators in detail here, a plurality of ventilators (3), (4), (5) ... are mounted on the roof (2) of this car body (1); these ventilators (3), (4), (5) ... are so-called forced ventilators that function as ventilation devices forcing air into the car from the outside while it is traveling, and legs (3a), (4a), (5a) at the four corners of each of the ventilators (3), (4), (5) ... are secured to the rooftop (2) by bolts (23). In this instance, each of the ventilators (3), (4), (5) ... is mounted on the car body (1) in an insulated state.

Furthermore, two antennas (30a), (30b) are mounted using the bolts (23) that secure the legs (3a) at the four corners of the ventilator (3). In addition, two antennas (30c), (30d) are mounted using the bolts (23) that secure the legs (4a) at the four corners of the ventilator (4) which is adjacent to the ventilator (3).

Showing enlargements of the situation in which these antennas (30c), (30d) are mounted on the ventilator (4) in Fig. 3 and Fig. 4, a square-U shaped cover (24) is mounted around the ventilator (4) by way of the bolts (23). In this instance, the cover (24) is configured so that it does not block the air passage part (4b) of the ventilator (4). Furthermore, one end of linking members (34) comprised by the antennas (30c) and (30d) is secured to the top part of this cover (24), and along with each of these linking members (34) securing a reflector (33) substantially in the middle, the conductor rods (31), (32) are secured to the other end. Here, the two conductive rods (31) and (32) are secured to the linking member (34) with a prescribed gap. In addition, an insulating material is used for the linking members (34). In addition, in this example, angle materials with L-shaped cross-sections are used for the conductive rods (31), (32) and reflectors (33), and are configured so that they may easily mounted.

Here, a space H, in the height direction, between the upper part of each ventilator and the lower edge of the reflector (33) is set to at least 15 mm, and a width L, in the horizontal direction, between each ventilator and the reflector (33) is set to a width of at least 20 mm; furthermore, the reflector height B is set to 70 mm or greater. In this instance, larger values for the height H and width L of the ventilator and the height B of the reflector (33) itself are preferable in terms of the antenna characteristics, but the size of equipment that can actually be installed on the rooftop (2) is determined by standards such as rolling stock gauge, such that very large antennas cannot be mounted, and this is limited to the values described above or values somewhat larger than these values.

With the four antennas (30a), (30b), (30c), (30d) mounted in this manner, each of the antennas (30a), (30b), (30c), (30d) only receives radio waves in the direction in which the conductor rods (31), (32) are disposed; radio waves oriented toward the conductor rods (31), (32) from the opposite side (ventilator side) are blocked by the reflector (33), so that the occurrence of standing waves due to reflected radio waves can be suppressed. Therefore, radio waves that come from all directions in substantially 360° may be received by the four antennas (30a), (30b), (30c), (30d), which are installed in positions that each differ by 90°.

Furthermore, the four antennas (30a), (30b), (30c), (30d) configured in this manner are connected by the coaxial cables (35) to the switch (41) inside the under-floor unit (40) that is hung beneath the floor of the car body (1). The equipment for receiving teletext broadcasts is housed in this under-floor unit (40), and the switch (41) selectively outputs received signals supplied by any of the antennas under the control of a discriminator circuit (44), which will be discussed below.

Furthermore, this switch (41) supplies the received signal that is output to a ghost reduction tuner (43) via a booster (42), and this ghost reduction tuner (43) receives a television broadcast signal for a prescribed channel that is set in advance. In this instance, the ghost reduction tuner (43) uses a GCR signal that has been inserted into the vertical blanking interval to perform ghost reduction on the received broadcast signal; in addition to channel tuning unit and an intermediate frequency amplifier/demodulator unit, this is provided with a ghost suppression filter, GCR signal extraction circuit, comparator circuit, control circuit and the like; the GCR signal, in which distortion occurs due to irregular reflection of radio waves and the like, and a reference signal are compared, so as to suppress reflected wave signals.

Here, in this example, the television broadcast signal for the prescribed channel obtained by this ghost reduction tuner (43) is supplied to the discriminator circuit (44), and the level of the synchronization signal included in the television broadcast signal received by this discriminator circuit (44) is determined; selection of the antenna line by the switch (41) obtains the synchronization signal with the best level, so as to constitute what is known as antenna diversity. In this instance, a timer circuit (45) is connected to this discriminator circuit (44), and the level discrimination described above is carried out in at prescribed intervals with control by the timer circuit (45).

Furthermore, the television broadcast signal obtained by the ghost reduction tuner (43) is supplied to the teletext broadcast decoder (46), and a teletext broadcast signal of text, graphics and the like that was multiplexed in the vertical blanking interval of the broadcast signal is obtained by this teletext broadcast decoder (46). In this instance, a plurality of teletext broadcast programs are sent in a single channel of television broadcast signal, and when at least one frame's worth of data for a prescribed teletext broadcast program that was set in advance has been obtained, this data is recorded in the memory (47) connected to the teletext broadcast decoder (46). In other words, the teletext broadcast decoder (46) has a circuit that determines whether or not each teletext broadcast frame that is received and obtained is complete; and when it is determined by this circuit that complete frame data for even one frame has been obtained, if this data is from a required teletext broadcast program, it is stored in the memory (47).

Describing the configuration of this memory (47) here, the data storage part of this memory (47) is divided into a plurality of areas, and the areas are used as shown in Fig. 5. In other words, this is configured so that four teletext broadcast programs A, B, C. D may be stored, with areas a1 through a10, b1 through b10, c1 through c10 and d1 through d10, which can store 10 frame's worth [of data] from page 1 to page 10, for each program. In this instance, areas a1 through a10, b1 through b10, c1 through c10 and d1 through d10 are configured so that, if data for a prescribed teletext broadcast program stored is temporarily stored therein when the vehicle (1) starts driving, the stored data for each area can be updated independently; and when it has only been possible to receive some of the pages (frames) of a teletext broadcast program, only the storage areas for these pages that it was possible to receive are overwritten. Therefore, there are instances where the data stored for each page comprised by the teletext broadcast programs A, B, C, D is not stored at the same time. Moreover, when the teletext broadcast programs A, B, C, D are made up of 10 or fewer pages, pages for which data is not obtained are left as empty areas.

Furthermore, the data for the prescribed teletext broadcast program stored in the memory (47) in this manner is sequentially read out to the teletext broadcast decoder (46) and made into a video signal for displaying the text, graphics and the like as images, this video signal being output from the under-floor unit (40) via a coaxial cable. When, in this instance, at least one frame's worth of any program of the four stored teletext broadcast programs A, B, C, D is overwritten, this overwritten program is read sequentially from the first page to the final page and is displayed.

Moreover, the output video signal from the under-floor unit (40) is a baseband video signal (in other words a video signal that is not RF modulated). In this example, in addition, a power supply circuit (48) is provided in the under-floor unit (40), and a low voltage DC power supply is output from this power supply circuit (48).

Furthermore, the coaxial cable that outputs the video signal from the under-floor unit (40) is connected to a three-way distributor (61) in the car body (1) to provide the output video signal. In addition,

the power supply output from the power supply circuit (48) is also supplied to the three-way distributor (61). This three-way distributor (61) is configured so that the baseband video signal is distributed three ways.

Furthermore, of the first second and third distribution outputs from this three-way distributor (61), the first distribution output is supplied to a first two-way distributor (71), the second distribution output is supplied to a connection terminal (62) provided on a connection surface on a first end (one end) of the car body (1) and the third distribution output is supplied to a connection terminal (63) provided on a connection surface on a second end (other end) of the car body (1). In addition, the power supply supplied to the three-way distributor (61) is also supplied to the first two-way distributor (71).

This first two-way distributor (71) is configured so that the baseband video signal that is supplied is distributed two ways.

Furthermore, the first distribution output distributed by the first two-way distributor (71) is supplied to a second two-way distributor (72) connected to a subsequent stage, and the second distribution output is supplied to a 13th two-way distributor (83) that is connected to a subsequent stage. In this instance, the power supply supplied from the three-way distributor (61) side is supplied to the second and 13th two-way distributors (72) and (83).

This second two-way distributor (72) is configured so as to perform two-way distribution in the same manner as the first two-way distributor (71), and the first distribution output is supplied to a television receiver (102) mounted inside the car, while the second distribution output is connected to a third two-way distributor (73).

Hereafter, the baseband video signal supplied by the two-way distributors (73), (74), (75) ... (82) connected to the subsequent stage is distributed in two in the same manner, and the first distribution outputs are supplied to the corresponding television receivers (103), (104), (105) ... (111) mounted inside the car, while the second distribution outputs are supplied to the two-way distributors (74), (75), (76) ... (82) connected to the subsequent stage. However, the second distribution output of the 12th two-way distributor (82) connected at the end is supplied to a television receiver (112).

In this instance, the power supply supplied from the two-way distributor in the previous stage is supplied to television receivers connected to the various two-way distributors and the two-way distributor in the subsequent stage.

In addition, the first distribution output of the 13th two-way distributor (83) connected to the second distribution output side of the first two-way distributor (71) is supplied to a television receiver (113) mounted inside the car, while the second distribution output is supplied to a 14th two-way distributor (84) in the subsequent stage.

Hereafter, the baseband video signal supplied by two-way distributors (84), (85), (86) … (93) connected to subsequent stage is distributed in two in the same manner, and the first distribution outputs are supplied to the corresponding television receivers (114), (115), (116) … (124) mounted inside the car, while the second distribution outputs are supplied to two-way distributors (85), (86), (87) ... (93) connected to the subsequent stage. However, the second distribution output of the 23rd two-way distributor (93) connected at the end is supplied to a television receiver (124).

In this instance as well, the power supply supplied from the two-way distributor in the previous stage is supplied to television receivers connected to the various two-way distributors and the two-way distributor in the subsequent stage.

Moreover, when the connection terminals (62) and (63) provided on the connection surface are linked to other preceding and following cars, which are not provided with tuners or the like, they are connected to video signal input terminals in these connected cars (not shown in the drawings). The video signals for the teletext broadcasts and the like may be supplied to preceding and following cars. In this instance, the power supply necessary for the television receivers in the preceding and following cars is supplied by a power supply circuit in each of the cars.

Next, the operation when teletext broadcast images are displayed on the television receivers (101), (102), (103) ... (124) connected in this manner will be described.

First, the teletext broadcast is received, and the data for the required teletext broadcast program is stored in the memory (47) connected to the teletext broadcast decoder (46). If, in this instance, the television broadcast signal reception status is good, the operation of storing this to the memory (47) will be completed in a short time, but because the service is provided when the vehicle (1) actually is traveling, if at least one frame's worth of data for a required teletext broadcast program can be obtained by the teletext broadcast decoder (46), when the reception status is temporarily good, this obtained frame data is stored in the memory (47), and the data in the same page, which was stored previously, is updated with the data that was newly received.

In other words, as is shown in the flow chart in Fig. 6,

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