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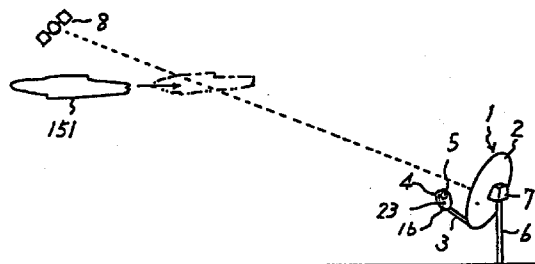
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(54) DISPLAY FOR ADJUSTING DIRECTION OF SATELLITE SIGNAL RECEIVING ANTENNA

(57) A direction adjusting display utilized when the direction of a satellite signal receiving antenna is adjusted. The direction of an antenna is determined watching the display on a display so that the antenna receives the strongest signals irrespective of the level of the satellite signal reaching the ground. At the same time the range of direction in which the antenna receives signals in a good condition is found on the basis of what is displayed on the display. The direction adjusting display generates a judgement reference level lower by a predetermined level than the peak level of the signal received by the antenna. The display judges the level of the received signal using the judgement reference level, and displays the result of judgement thereon.

FIG.1



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Description

Technical Field

5 The invention relates to an indicating device for adjusting the direction of an antenna for receiving a satellite signal which is used in direction adjustment for orienting an antenna for receiving a satellite signal to a satellite.

Background Art

10 In a known indicating device of this kind for adjusting of the direction of an antenna for receiving a satellite signal, the level of a received signal which is output from an antenna receiving radio waves from a satellite is compared with a predetermined reference level, and, when the signal level is higher than the reference level, an indicator lamp is lit, and, when the signal level is not higher than the reference level, the indicator lamp is not lit (for example, see Japanese utility model publication (Kokoku) No. HEI2-24244). The indicating device informs that the antenna is oriented to a good-
 15 reception direction, by means of lighting of the indicator lamp. In the case where the reference level of an indicating device having such a configuration is set to be relatively high, when the indicating device is used for adjusting the direction of an antenna in a district where the level of a satellite signal is relatively high, such as Nagoya district, there is the following advantage. The adjustment of the direction of an antenna is conducted by gradually changing the direction of the antenna faced to the sky, while watching the indicator lamp. When, during this process, the antenna is oriented to
 20 a direction along which the antenna can receive radio waves from a satellite at a high level, i.e., a good reception direction, the indicator lamp is lit. When the antenna is not oriented to the good reception direction, the indicator lamp is not lit. Therefore, the antenna can be oriented to the good reception direction by orienting the antenna to the direction in which the indicator lamp is lit.

When such a direction adjustment indicating device in which the reference level is set to be relatively high is used
 25 for adjusting the direction of an antenna in a district where the level of a satellite signal is relatively low, such as Okinawa district, however, there arises the following problem. In such a district, even when the antenna is oriented to any direction, a satellite signal received by the antenna is low in level. Therefore, the level of the received signal fails to reach the reference level and the indicator lamp remains not to be lit. As a result, a problem in that it is impossible to determine the good reception direction to which the antenna is to be oriented is produced.

30 To comply with this, the reference level may be set to be low so that the indicator lamp adequately performs the lighting and nonlighting operations in such a low-level district. However, this produces another problem as follows. In the high-level district, even when the antenna is oriented to any direction, the indicator lamp remains to be lit. As a result, a problem in that it is impossible to determine a correct direction to which the antenna is to be oriented is produced.

35 A direction adjustment indicating device of the type which can solve the problem is proposed. The direction adjustment indicating device comprises: a peak-holding circuit which receives from an antenna for receiving a satellite signal a received signal that is varied by changing the direction of the antenna, and captures the peak value of the received signal; level judging means for conducting level-judgment on the level of the received signal on the basis of the peak value; and an indicator lamp which performs indication corresponding to the judgment result of the level judging means
 40 (Japanese patent publication (Kokai) HEI6-303020).

Such an indicating device operates in the following manner. The direction of the antenna is gradually changed in one direction under the state where the antenna is faced to the sky. Then the level of the received signal is varied in accordance with the change of the direction of the antenna. Consequently, the peak value of the level of the received signal is obtained at some position in the path of changing the direction of the antenna. Thereafter, the direction of the
 45 antenna is returned along the path. In the returning process, the level of the received signal is initially lower than the peak value, and hence the indicator lamp is in the lighting state. Thereafter, the antenna is again oriented to the position where the peak value has been obtained. At this time, the level of the received signal is equal to the peak value, and hence the indicator lamp is not lit. In the subsequent process of further changing the direction of the antenna, the level of the received signal is lower than the peak value, and hence the indicator lamp again enters the lighting state. In this
 50 way, the indicating device informs that the antenna is oriented in a good reception direction, by means of nonlighting of the indicator lamp. Therefore, the antenna can be oriented to a direction in which best reception is attained, by orienting the antenna to the direction in which the indicator lamp is not lit.

The direction adjustment indicating device operates in the same manner as described above both in a district where a satellite signal reaching the ground is high in level as a whole, and that where a satellite signal reaching the
 55 ground is low in level as a whole.

According to the thus configured direction adjustment indicating device, both in a district where the level of a satellite signal is high as a whole and that where the level of a satellite signal is low, therefore, an antenna can be oriented to a direction along which good reception can be attained, irrespective of the kind of the district.

The thus configured indicating device has a further advantage as follows. In the case where an antenna is oriented

as described above to a direction in which best reception is attained and the antenna is then fixed at the position, when the direction of the antenna is erroneously caused to be deviated from the direction, the level of the received signal is lowered. Then the indicator lamp is lit and the worker can be informed that the antenna is not correctly oriented. Therefore, the mistake of fixing the antenna while it is oriented to an incorrect direction is prevented from occurring.

The thus configured indicating device has a still further advantage as follows. After the antenna is installed so as to be oriented to the optimum reception direction which is obtained as described above, the antenna may be fanned by a strong wind to be oriented in an inadequate direction, so that the level of the received signal of the antenna is lowered. Also in this case, the indicator lamp is lit so that the state where the direction of the antenna is not in adjustment is clearly and rapidly informed, thereby urging the incorrect direction of the antenna.

However, the thus configured indicating device has the following problem. When deviation of the direction of the antenna due to the above-mentioned fixing work is small in degree, the level reduction of the received signal of the antenna due to the deviation is small and hence the receiving property is little impaired (for example, the quality of a television image obtained from the received satellite signal is little deteriorated). Also in such a case, the level reduction of the received signal causes the indicator lamp to enter the lighting state. As a result, there arises the problem in that the worker who adjusts the direction of the antenna feels a sense that the direction of the antenna is deviated, and uselessly conducts read-justment of the direction.

The thus configured indicating device has a further problem as follows. Under a state where an antenna is installed and used, a case often occurs where the antenna is temporarily covered by a cloud or the position of the satellite is temporarily deviated by a small angle. Then the level of the received signal of the antenna is lowered. In such a case, there arises a problem in that the indicator lamp enters the lighting state and this causes a misunderstanding that the direction of the antenna is deviated.

The indicating device for adjusting the direction of an antenna for receiving a satellite signal according to the invention is provided in order to solve the problems of the prior art.

It is a first object to provide a configuration which, in a case where the direction of an antenna is to be adjusted, enables the antenna to be oriented to a direction along which good reception of a satellite signal can be attained, on the basis of indication of an indicator in the strictly same manner both in a district where the level of a satellite signal reaching the ground is high and that where the level is low.

It is a second object to provide a configuration which, in the above-mentioned case, can know the range of a direction along which good reception of a satellite signal can be attained, on the basis of indication of an indicator.

It is a third object to provide a configuration in which the direction of the antenna is determined so as to be in the vicinity of the center of the above-mentioned range as a result of knowing the range, and, even when the direction of the antenna is slightly deviated during the work of fixing the antenna, an indicator therefore can maintain the good-indication as far as the direction of the antenna is within the range of a direction along which good reception of a satellite signal can be attained, thereby avoiding a useless work of readjusting the direction of the antenna.

It is a fourth object to provide a configuration in which, when, after the above-mentioned direction is determined, the direction of the antenna is erroneously deviated to a direction along which good reception of a satellite signal cannot be attained during the work of fixing the antenna, the worker can be informed of this by means of failure-indication of the indicator.

It is a fifth object to provide a configuration in which, even when, under a use state of an antenna where the direction of the antenna is determined and the antenna is fixed, the antenna is covered by thin clouds or the position of the satellite is temporarily deviated by a small angle so that the level of the received signal from the antenna is slightly lowered, the indicator can maintain the good-indication as far as the level is within the range where an adequate image of a television receiver can be maintained, thereby preventing the above-mentioned misunderstanding from arising.

It is a sixth object to provide a configuration in which, when, under the use state of an antenna, the antenna is largely changed in direction by a strong wind or the like so as to be oriented to an inadequate direction along which good reception cannot be attained, this can be informed by means of failure-indication of the indicator.

Other objects and advantages will become more apparent from the drawings and the description relating to the drawings.

Disclosure of Invention

The indicating device for adjusting the direction of an antenna for receiving a satellite signal according to the invention of the present application comprises:

- a level reducing circuit which receives a received signal from the antenna for receiving a satellite signal, and which produces a level-reduced signal, a level of the level-reduced signal being lower than a level of the received signal by a constant level;
- a reduced-peak-value detecting circuit which detects a peak value of the level-reduced signal, the peak value varying in accordance with a change of the level of the received signal, and which sets the detected peak value as a

judgement reference value;

level judging means for conducting level-judgment on the level of the received signal on the basis of the judgement reference value; and

an indicator which performs indication corresponding to a judgment result of the level judging means.

The invention of the present application can attain the following advantages.

The indicator operates on the basis of the peak value of the level of the received signal from the antenna. When the direction of an antenna for receiving a satellite signal is to be adjusted, therefore, the indicator operates in the same manner both in a district where the level of a satellite signal falling from a satellite is high, and that where the level is low. As a result, both in the districts, the antenna can be oriented to a direction along which good reception can be attained, on the basis of indication of the indicator.

In the adjustment of the direction of the antenna, the indicator performs good-indication in a range which includes the position where the level of the received signal of the antenna peaks, and which extends in, for example, lateral directions or to the sides of the position. Therefore, the worker who adjusts the direction can know the range of a direction along which good reception of a satellite signal can be attained, on the basis of indication of the indicator.

When such a range is once known, the direction of the antenna can be determined to be in the vicinity of the center of the range, and the work of fixing the antenna can be done there. Even when the direction of the antenna is slightly deviated during the work of fixing the antenna, the indicator therefore maintains the good-indication as far as the direction of the antenna is within the range of a direction along which good reception of the satellite signal can be attained. As a result, a useless work of readjusting the direction of the antenna can be avoided.

During the work of fixing the antenna, when the direction of the antenna is erroneously largely deviated, the indicator performs failure-indication, thereby demanding the worker to correct the direction of the antenna.

The indicating device for adjusting the direction of an antenna for receiving a satellite signal according to the invention of the present application comprises:

best-direction judging means for receiving a received signal from the antenna for receiving a satellite signal, and for producing an output for causing an indicator to perform good- or failure-indication depending on whether a level of the received signal reaches a peak value or not;

an indicator which performs indication corresponding to a judgment result of the best-direction judging means;

minimum-reference judging means for conducting level-judgment on the level of the received signal on the basis of a minimum reference value corresponding to a minimum reception enabled level; and

an indicator which performs indication corresponding to a judgment result of the minimum-reference judging means.

The invention of the present application can attain also the following advantages.

Under a use state of an antenna where the direction of the antenna is determined and the antenna is fixed as described above, the indicator continues the good-indication as far as the level of the received signal of the antenna satisfies the minimum reception enabled level at which an adequate image of a television receiver can be maintained. Even when the antenna is covered by thin clouds or the position of the satellite is temporarily deviated by a small angle, therefore, the indicator is kept to be in the good-indication state. As a result, a misunderstanding that the direction of the antenna is deviated is prevented from arising.

Under the above-mentioned use state, when the level of the received signal cannot satisfy the minimum reception enabled level, the indicator performs the failure-indication. When the antenna is largely changed in direction by a strong wind or the like so as to be oriented to an inadequate direction along which good reception cannot be attained, therefore, this can be rapidly informed by means of the failure-indication.

Brief Description of Drawings

Fig. 1 is a perspective view of an installation state of an antenna for receiving a satellite signal.

Fig. 2 is a block circuit diagram of a converter in which a direction adjustment indicating device is incorporated.

Fig. 3 is a view showing a path of changing the position in the sky to which the antenna is oriented, and the reception level in the path.

Fig. 4A is a view showing states of level changes of various signals caused by changes of the oriented position of the antenna during adjustment of the direction of the antenna.

Fig. 4B is a view showing lighting and nonlighting states of an indicator in the case of Fig. 4A.

Fig. 5 is a block circuit diagram of a converter in which a direction adjustment indicating device of another embodiment is incorporated.

Fig. 6 is a circuit diagram showing a peak-holding circuit, time stopping means, and a switch circuit which are used in the direction adjustment indicating device of Fig. 5.

Fig. 7A is a view showing a path of changing the oriented position of the antenna in the sky.

Fig. 7B is a view showing changes of the level of the received signal and the indication state of the indicator in the path of Fig. 7A.

Fig. 8 is a block circuit diagram showing a further embodiment of the direction adjustment indicating device.

Fig. 9 is a block diagram showing another example of a judgment reference value producing circuit.

Fig. 10 is a block diagram showing a further example of the direction adjustment indicating device (fragmentary view).

Fig. 11 is a block diagram showing a further example of the direction adjustment indicating device (fragmentary view).

Fig. 12 is a view showing relationships among the direction of an antenna of the direction adjustment indicating device of Fig. 11, the level of the received signal, and a range where an indicator performs the good-indication.

Best Mode for Carrying Out the Invention

Hereinafter, drawings showing embodiments of the present application will be described. Fig. 1 shows an installation state of an offset parabolic antenna 1 which is an example of an antenna for receiving a satellite signal. The reference numeral 2 designates a reflector, 3 designates an arm, and 4 designates a converter having a primary radiator. The reference numeral 5 designates a cover of the primary radiator in the converter 4. As well known, the antenna 1 is attached to a mast 6 by using a support member 7. The support member 7 is configured so that the azimuth and elevation angles of the antenna 1 can be adjusted and the state where the angles are adjusted can be fixed. The reference numeral 8 indicates the existence of a geostationary satellite (a broadcasting satellite or a communication satellite)) which transmits a satellite signal in the sky.

Fig. 2 shows the circuit of the converter 4 in the form of blocks. In the circuit, reference numerals 11 to 16 designates well-known components used in a converter of this kind. Namely, 11 designates the primary radiator for receiving the satellite signal and comprising a wave guide 12 for introducing the satellite signal, and a probe 13 for taking out the satellite signal. The reference numeral 14 designates a frequency converting circuit which converts the received signal into a signal of an intermediate frequency, 15 designates a power source isolation filter, and 16 designates an output terminal.

The reference numeral 17 designates a direction adjustment indicating device for adjusting the direction of the antenna 1. In the example, the indicating device is incorporated in the converter 4. In the direction adjustment indicating device 17, 17a designates an input end which receives the received signal from the antenna 1 for receiving a satellite signal. As an example of the received signal, the input end accepts the intermediate frequency signal. The reference numeral 17b designates good-direction judging means for, on the basis of the accepted received signal, judging whether the direction of the antenna 1 is within the range of a direction along which a signal from the satellite can be satisfactorily received, or not. The reference numeral 23 designates an indicator which indicates a judgement result of the good-direction judging means 17b.

The direction adjustment indicating device 17 will be further described. The reference numeral 18 designates an amplifier which amplifies the received signal in order to facilitate the handling of the received signal. The input end of the amplifier is the input end 17a. The reference numeral 19 designates a detecting circuit which is used for shaping the received signal into a form suitable for handling in circuits which will be described later. The detecting circuit converts the intermediate frequency signal into a DC detection signal. The detection signal is different from the received signal entering the input end 17a, only in shape, and corresponds in level to the signal in a one-to-one relationship. In the discussion with respect to the level in the direction adjustment indicating device in the specification, therefore, the detection signal is handled as the received signal.

The good-direction judging means 17b comprises a judgment reference value producing circuit 17c which produces a predetermined judgment reference value, and level judging means 22 for conducting level-judgment on the received signal on the basis of the judgment reference value. The judgment reference value is determined so as to have a value which is lower than a peak value of the received signal by a constant level (for example, 1 dB). The object of setting the judgment reference value to be such a low level is to slightly widen the angle range in which the indicator 23 performs the good-indication. When the angle range of the good-indication is wide in this way, the operation of orienting the antenna into the range can be easily done during the work of orienting the antenna to the good reception direction while watching the good-indication of the indicator 23. The judgment reference value may be set to be a lower level. However, it is preferable to set the value to be higher than the minimum reception enabled level, i.e., the minimum received signal level at which the quality of a television image obtained from a signal received in the reception of a satellite signal can be ensured. For example, the minimum reception enabled level is the level of the received signal obtained when a satellite signal of a CN ratio of 13 dB is received. The object of the antenna 1 is to receive a usual satellite signal. Consequently, a peak value of the level of the received signal from the antenna is usually sufficiently higher than the level corresponding to 13 dB, so that the judgment reference value is higher than the minimum reception enabled level.

The judgment reference value producing circuit 17c comprises a level reducing circuit 24 which produces a level-reduced signal serving as the base for producing the judgment reference value, and a reduced-peak value detecting circuit 21 which produces the judgment reference value from the level-reduced signal. The level reducing circuit 24 receives the detection signal and produces the reduced signal in which the level is lowered by a constant level (see δ of Fig. 4A, for example, a level corresponding to 1 dB of the received signal). For example, the circuit outputs a DC voltage signal of the level which is obtained by multiplying the level of the detection signal by a decimal, as the reduced signal. For example, a resistance division circuit may be used as the level reducing circuit 24. Alternatively, a division circuit using a semiconductor may be used. The reduced-peak value detecting circuit 21 detects the peak value of the level-reduced signal which is varied in accordance with the change of the level of the received signal and which uses the detected peak value as the judgment reference value. As an example of the reduced-peak value detecting circuit, a peak-holding circuit which holds the maximum level (peak value) among the levels of signals successively entering the circuit and which always outputs the signal of the held peak value is shown. For example, the peak-holding circuit may have a well-known configuration in which the maximum level is held by means of charging of a capacitor.

As an example of the level judging means 22, a comparator circuit is shown. The comparator circuit 22 compares the level of a signal (for example, the received signal) supplied to one input end 22a with that of a signal (for example, the judgment reference value) supplied to the other input end 22b. In the cases of (1) the former is higher than the latter and (2) the two levels are equal to each other, the circuit outputs a signal of "L" through an output end 22c as a good-indication output for causing the indicator to perform the good-indication. In the case of (3) the former is lower than the latter, the circuit outputs a signal of "H" through the output end 22c as a failure-indication output for causing the indicator to perform the failure-indication. The case (2) may be included in the failure-indication in place of the good-indication. The relationship of "L" and "H" may be inverted.

The indicator 23 performs indication corresponding to the judgment result of the level judging means 22, or performs the good-indication in response to the good-indication output, and the failure-indication in response to the failure-indication output. Because of the excellent visibility from a distant position, a light emitting diode is used as the indicator. As an example of the good-indication, the indicator 23 performs nonlighting indication, and, as an example of the failure-indication, lighting indication. As shown in Fig. 1, the indicator 23 is disposed so as to be exposed on the outer face of the converter 4 for visibility. As the indicator, alternatively, a buzzer which, when the failure-indication is to be done, sounds, and, when the good-indication is to be done, does not sound, or a meter in which, when the good-indication is to be done, a needle moves, and, when the failure-indication is to be done, does not move may be used.

The operation of the converter 4 will be described. As well known, a DC current for operating the converter is supplied from an external to the output terminal 16 through a transmission line connected to the output terminal 16. The DC current passes through the power source isolation filter 15 and is then output as indicated by an arrow 15a so as to be supplied to the frequency converting circuit 14 through a power supplying circuit which is not shown, with the result that the circuit 14 enters an operation state. The power supplying circuit supplies a current also to various components of the indicating device 17 so that the components enter an operation state. The satellite signal sent from the satellite 8 is reflected by the reflector 2 and then impinges into the wave guide 12 of the primary radiator 11. The signal is picked up by the probe 13 and then converted into the intermediate frequency signal by the frequency converting circuit 14. The intermediate frequency signal is output through the filter 15 and the output terminal 16 to the transmission line, and then reaches a television receiver via the transmission line.

By contrast, in the indicating device 17, the amplifier 18 receives the intermediate frequency signal as the received signal and amplifies the signal. The amplified signal is detected by the detecting circuit 19 so as to become the DC detection signal. The level reducing circuit 24 always receives the detection signal and outputs the level-reduced signal which is obtained by reducing the level of the detection signal by the constant level δ . The reduced-peak value detecting circuit 21 receives the reduced signal, holds the peak value, i.e., the highest value of the reduced signals which have been successively input until the present timing, and always outputs a signal (DC signal) of the held peak value as the judgment reference value. The level judging means 22 receives the detection signal and the judgment reference value and operates in the above-mentioned manner. In accordance with the output of the means, the indicator 23 is lit or is not lit.

Next, the adjustment of the direction of the antenna 1 will be described. First, the elevation angle of the antenna is previously adjusted. This is conducted in order to ensure that, in the succeeding adjustment of the azimuth angle, the path of the oriented position of the antenna passes the position of the satellite 8. The elevation angle is adjusted in a manner which is usually known as a method of adjusting an antenna of this kind for receiving a satellite signal. Specifically, the elevation angle of the antenna 1 is previously set to be a known elevation angle for the installation district, by adjusting the support member 7, and then fixed.

Next, under this state, the azimuth angle adjustment which is the adjustment of the direction of the antenna conducted by using the indicating device 17 is conducted. The process will be described with reference to Figs. 3, 4A, and 4B, and Table 1 below. In Fig. 3, 25 designates a path along which the oriented position of the antenna is caused to pass in the sky as a result of the adjustment of the azimuth angle, and P3 designates a point where, when the antenna 1 is oriented to the point in the path 25, the maximum reception level VH (in Nagoya district, for example, the CN ratio

of 22 to 23 dB) of the satellite signal is obtained. The direction of the point P3 is the best reception direction. In the example, the direction coincides with the direction along which the satellite 8 exists. The reference numeral 28 shows a region in which good reception of the satellite signal is enabled, i.e., the good-reception range where, when the antenna is oriented to the range, the reception level VM is lower than the maximum reception level by a reduction allowable level ΔV or less. The reduction allowable level ΔV means the degree of reduction of the reception level which does not substantially impair the receiving property as compared with the reception level obtained in the best reception direction. For example, the reduction allowable level is about 1 dB. In this case, the good reception direction region 28 is the range of about 1 degree about the best reception direction P3. The constant level of the level reducing circuit 24 is set to be a voltage level difference corresponding to the reduction allowable level ΔV . In the example, for example, the constant level is set to be 20% so that the output level is about 80% with respect to the input level of the level reducing circuit 24. The range 28 is a range where a reception level which is called the allowable limit in the technical field is obtained. The reference numerals 28' and 28" designate ranges where, when the antenna is oriented to either of the ranges, the reception level VL is lower than the maximum reception level VH by a reduction allowable level ΔV or larger. The reference numerals P2 and P4 designate positions of boundaries on the path 25 between the range 28 and the ranges 28' and 28". In Fig. 4A, Rf1 designates the judgment reference value, 19s the detection signal, and 24s the level-reduced signal. The points A, B, and C in Table 1 indicate the states of the points which are indicated by the same letters in Fig. 2, respectively. The values at the points A and B are in millivolts. Regarding the state of the indicator 23, mark ● indicates the nonlighting state and mark ○ the lighting state.

Table 1

Positions	P1	P2	P3	P4	P5	P4	P3	P2	P3
A	10	30	40	32	20	32	40	30	40
B	8	24	32	32	32	32	32	32	32
C	L	L	L	L	H	L	L	H	L
Indicator	●	●	●	●	○	●	●	○	●

First, the azimuth angle of the antenna 1 is gradually changed in one direction. When the electrical oriented position of the antenna 1 is gradually changed along the path 25 from the position P1 toward the positions P2 and P3, the level of the satellite signal received by the antenna 1 is gradually raised, and the levels of the detection signal and the level-reduced signal are raised as indicated by the solid and broken lines in Fig. 4A, respectively. Also the value held by the reduced-peak value detecting circuit 21 is gradually raised by the same value as the level-reduced signal (see Table 1). When the oriented position exceeds the position P3 and is further moved toward the position P4, the level of the satellite signal received by the antenna 1 is gradually lowered, and the detection signal and the level-reduced signal are gradually lowered in level. In the process conducted until now, therefore, the level of the level-reduced signal reaches a peak value at the position P3. The peak value of the level-reduced signal is stored in the reduced-peak value detecting circuit 21 and set as the judgment reference value. When the direction of the antenna 1 is further moved so as to pass the point P4 toward the position P5, the level of the received signal becomes lower than the judgment reference value. Consequently, the output of the level judging circuit 22 is "H" and the indicator 23 is lit so as to indicate that a peak has been detected.

When the indicator 23 is lit in this way, the direction of the movement of the antenna 1 is made opposite along the path 25. In the returning process, as seen from Table 1 and Fig. 4A, the level of the detection signal becomes first equal at the position P4 to the judgment reference value. Therefore, the output of the level judging circuit 22 becomes "L" and the indicator 23 is not lit. In the process in which the direction is moved from the position P4 toward the position P2 through the position P3, the level of the detection signal is higher than the judgment reference value, and hence the indicator 23 maintains the nonlighting state. When the direction reaches the position P2, the level of the detection signal again becomes lower than the judgment reference value, and hence the indicator 23 is again lit.

Fig. 4B shows the relationship between the operation of the antenna 1 and the state of the indicator 23 in the above-mentioned process. The oriented position of the antenna is changed in one direction as indicated by an arrow 26. In the process, the indicator 23 is continuously in the nonlighting state when the oriented position is between P1 and P4, and, when the oriented position exceeds the position P4, the indicator 23 enters the lighting state. When the indicator 23 enters the lighting state, the direction of changing the direction of the antenna 1 is inverted at, for example, the position P5, so that the direction of the antenna is changed along the direction of an arrow 27. In the process in which the direction of the antenna 1 is changed along the arrow 27, the lighting of the indicator 23 is turned off at the position P4, and the indicator 23 maintains the nonlighting state in the range elongating immediately before the direction

reaches the position P2 through the position P3. When the direction reaches the position P2, the indicator 23 is lit. From the operation of the indicator 23, the good reception region 28 is known.

When the good reception direction region 28 is known in this way, the direction of the antenna 1 is moved with eye measurement to a substantially center position of the range 28 as indicated by an arrow 29. As a result, the antenna 1 is oriented to the direction of the best reception point. However, the difference between the level of the received signal at the center of the range 28 and that of the received signal at the ends is 1 dB at most, and there is substantially no difference in receiving property. Therefore, the movement to a substantially center portion of the range 28 can be roughly conducted. When the adjustment of the direction of the antenna is required to be more precise, the adjustment may be conducted in the following manner. Only in the range 28, the indicator 23 is in the nonlighting state. Therefore, the range 28 is determined while the direction of the antenna 1 is laterally changed several times, and the antenna is then oriented to the center position of the range.

After the direction of the antenna 1 is adjusted as described above, the support member 7 is clamped so that the azimuth angle of the antenna 1 is fixed, thereby completing the adjustment of the azimuth angle of the antenna 1. When the direction of the antenna 1 is laterally deviated during the fixing work by flection of the support member 7 or the like, the reception level of the satellite signal in the antenna is lowered and also the level of the received signal which is supplied to the input end 17a is lowered. In the case where the degree of the deviation is small as indicated by an arrow 30 in Fig. 4B (the direction of the antenna 1 is within the range 28), the reduction of the reception level is small and the quality of a received image is little deteriorated. In this case, the level of the detection signal is higher than the judgment reference value. Consequently, the output of the level judging circuit 22 is maintained to be "L" and the indicator 23 keeps the good indication.

By contrast, in the case where the direction of the antenna 1 is largely deviated in the work of fixing the azimuth angle of the antenna and the oriented position is outside the good reception region 28, the level of the detection signal becomes lower than the judgment reference value as seen from Fig. 4A. Consequently, the output of the level judging circuit 22 becomes "H" and the indicator 23 is lit so as to indicate the failure of the direction of the antenna 1. In this case, therefore, the above-mentioned adjustment of the azimuth angle is again conducted.

Next, the case where the direction of the antenna 1 is adjusted by using the direction adjustment indicating device 17 in a district where the level of the satellite signal falling from the satellite to the ground is low will be described. In this case, the received signal from the antenna 1 is lower in level than that in the above-described case. In accordance with the degree of the reduction, therefore, also the values of the signals at the points A and B are lower than those listed in Table 1 as a whole. Since the judgment reference value is produced on the basis of the level of the received signal as described above, however, the relative level relationship between the received signal and the judgment reference value is the same as that of the above-described case. Therefore, the indicator 23 operates in the strictly same manner as the above-described case. As a result, the antenna 1 can be oriented to the good reception direction in the strictly same manner as the above-described case, on the basis of the indication of the indicator 23.

The direction adjustment indicating device 17 may be an independent direction adjustment indicating device which is housed in a case different from the case of the converter 4. When the direction of the antenna is to be adjusted, the input end 17a may be connected to the output terminal or the monitor terminal of the converter in the antenna and used in the adjustment of the direction of the antenna.

Next, another embodiment of the present application will be described with reference to Figs. 5 to 7. The example shows a direction adjustment indicating device in which, even in the case where the level of the received signal is slightly lowered by a change in weather or small deviation of the direction of the antenna under the use state of the antenna after completion of the direction adjustment of the antenna and fixation of the antenna, the indication state of the indicator is maintained to be the good-indication when the level is in the range where an adequate image of a television receiver can be kept. By contrast, in the case where the direction of the antenna is largely deviated and the level of the received signal is largely lowered so that an adequate image of a television receiver cannot be kept, the indicator performs the failure-indication.

Referring to Fig. 5, the direction adjustment indicating device comprises best-direction judging means 17d for, depending on whether the level of the received signal supplied to the input end 17a reaches a peak value or not, producing an output for causing the indicator to perform good-indication or failure-indication. The direction adjustment indicating device further comprises minimum-reference judging means 17e for conducting level-judgment on the level of the received signal on the basis of a minimum reference value corresponding to the minimum reception enabled level. When the direction of the antenna is to be adjusted, the best-direction judging means 17d is used for orienting the antenna to the best reception direction. The minimum-reference judging means 17e is used for checking whether the antenna used for receiving the satellite signal is in the state where its direction must be adjusted or not, and judges whether the level of the received signal is within the reception enabled level range or the range between the peak value of the received signal and the minimum reception enabled level or not. As an example of the best-direction judging means 17d, means configured by a received signal peak value detecting circuit 21A and the level judging means 22 is shown. As an example of the minimum-reference judging means 17e, means configured by a minimum-reference value producing circuit 75 and the level judging means 22 is shown.

The received signal peak value detecting circuit 21A holds the peak value of the received signal in a process where the level of the received signal is changed, and always outputs the held peak value. When a control signal is supplied to a control terminal 21c, the circuit releases the peak value which is held until this timing and stops the output of the peak value. When the control signal disappears, the circuit starts the process of holding a new peak value, and outputs the held peak value. As the received signal peak value detecting circuit 21A, a well-known peak-holding circuit may be used. The minimum-reference value producing circuit 75 produces the minimum reference value corresponding to the minimum reception enabled level. For example, a circuit which produces a plus DC voltage (e.g., 10 mV) by using a well-known resistance division circuit may be used as the minimum-reference value producing circuit 75.

The reference numeral 76 designates switch over means for selectively supplying one of the peak value held by the received signal peak value detecting circuit 21A and the minimum-reference value of the minimum-reference value producing circuit 75, to the level judging circuit 22. In the switch over means 76, the selection may be manually conducted. In the embodiment, means in which, when the good-indication of the indicator 23 continues for a predetermined time period, the signal supplied to the level judging circuit 22 is automatically switched from the peak value to the minimum-reference value is used as the switch over means. The predetermined time period has a value which is a sum of a time period, for example, 10 to 20 minutes that, in the work of adjusting the direction of the antenna, is usually required for, after orienting the antenna to the good reception direction, fixing the direction of the antenna, conducting the checking work, and then completing the direction adjusting work, and a spare time period of, for example, about 10 minutes. For example, the predetermined time period is about 30 minutes. As an example of the switch over means 76, means configured by time stopping means 77 and a switch circuit 78 is shown. The time stopping means 77 detects that the good-indication of the indicator 23 continues for the predetermined time period, and then supplies a control signal to the received signal peak value detecting circuit 21A, thereby stopping the output of the peak value from the received signal peak value detecting circuit 21A. When the output of the peak value from the received signal peak value detecting circuit 21A is stopped, the switch circuit 78 supplies the minimum reference value from the minimum-reference value producing circuit 75 to the level judging circuit 22, in place of the peak value. However, the time stopping means 77 is configured so that, even when the predetermined time period has elapsed, the received signal peak value detecting circuit 21A is caused to return to the state where the peak value is output, as soon as the indicator 23 enters the state where the failure-indication is done. As an example of the time stopping means 77, means configured by a timer circuit 79 and a stop circuit 80 is shown. The timer circuit 79 detects that the predetermined time period has elapsed under the state where the good-indication is done, and produces an instruction of activating the stop circuit. When failure-indication is done, the instruction is immediately canceled. When receiving the instruction from the timer circuit 79, the stop circuit 80 causes the output of the peak value from the received signal peak value detecting circuit 21A to be stopped.

The best-direction judging means 17d and the minimum-reference judging means 17e share the level judging means 22. Alternatively, the two means may use different level judging means, respectively. In the alternative, indicators which conduct indications respectively corresponding to judgement results of these level judging means may be independently disposed. When the different level judging means are used, the switch over means 76 is not used.

Next, Fig. 6 showing an example of the received signal peak value detecting circuit 21A, the time stopping means 77, and the switch circuit 78 will be described. As the received signal peak value detecting circuit 21A, a well-known configuration which uses a peak-holding capacitor is shown. The reference numeral 21a designates an input end, and 21b designates an output end. The reference numerals 81 and 82 designate amplifying circuits which are, for example, operational amplifiers. The reference numeral 83 designates a peak-holding capacitor, and 84 designates a diode for preventing discharge of the capacitor 83. As an example of the timer circuit 79 of the time stopping means 77, a well-known time-constant circuit is shown. The reference numerals 86 and 87 designate a capacitor and a resistor for a time constant, respectively. As an example of the stop circuit 80, a configuration in which the peak value is released by discharging the peak-holding capacitor 83 of the received signal peak value detecting circuit 21A and its output is stopped is shown. The reference numeral 89 designates a switch element for the discharge. As an example of the switch element, a semiconductor switch (for example, a transistor) is shown. The reference numeral 90 is a switch element for, when the indicating device 17 is powered off, rapidly discharging the capacitor 83. A control terminal 90a of the switch element is connected to the power source circuit for the indicating device 17. As an example of the switch circuit 78, a circuit in which switching diodes 92 and 93 are connected to each other as illustrated is shown. Among the outputs of the received signal peak value detecting circuit 21A and the minimum-reference value producing circuit 75, the one which is higher in level than the other is allowed to be supplied to the level judging means 22, by the switch circuit. Even when the output of the received signal peak value detecting circuit 21A is not stopped by the time stopping means 77, therefore, the switch circuit 78 supplies the output of the minimum-reference value producing circuit 75 to the level judging means 22 as far as the output of the received signal peak value detecting circuit 21A is lower than that of the minimum-reference value producing circuit 75.

The thus configured direction adjustment indicating device operates in the following manner. When the received signal is given to the input end 17a, the received signal peak value detecting circuit 21A receives the detection signal from the detecting circuit 19 and holds the peak value, i.e., the highest value of the detection signals which have been successively input until the present timing. The circuit outputs the held peak value. The level judging circuit 22 receives

the detection signal and the signal given through the switch circuit 78, and operates in the above-mentioned manner. In accordance with the output of the level judging circuit, the indicator 23 is lit or is not lit.

Next, the adjustment of the direction of the antenna by using direction adjustment indicating device will be described with reference to Fig. 7 and Table 2 below. In Fig. 7, 95 indicates a path in the sky along which the oriented position of the antenna is moved as a result of the adjustment of the azimuth angle, and P14 indicates the best reception point in the path 95. In Table 2, A, B, and C indicate the states of the points which are indicated by the same letters in Fig. 5, respectively. The values at points A and B are in millivolts. Regarding the state of the indicator 23, mark ● indicates the nonlighting state and mark ○ the lighting state.

Table 2

Positions	P11	P12	P13	P14	P15	P16	P17	P16	P15	P14	P13	P11
A	0	10	30	40	30	10	0	10	30	40	30	10
B	10	10	30	40	40	40	40	40	40	40	40	40
C	H	L	L	L	H	H	H	H	H	L	H	H
Indicator	○	●	●	●	○	○	○	○	○	●	○	○

First, in order to detect a peak value, the azimuth angle of the antenna 1 is gradually changed in one direction. When the electrical oriented position of the antenna 1 is changed along the path 95 from the position P11 toward the positions P12, P13, and P14 as shown by an arrow 96, the level of the satellite signal received by the antenna 1 is gradually raised as indicated by line B1 in Fig. 7B. Consequently, the level of the point A in the circuit is raised as shown in Table 2. At the position P11 where the level of the detection signal is 0, the minimum reference value is given to the level judging means 22. As shown in Table 2, therefore, the level of the point B is equal to the minimum reference value or 10 mV. As the oriented position of the antenna 1 is moved and the level of the detection signal is raised, the output of the received signal peak value detecting circuit 21A is increased. When the oriented position exceeds P12, the output of the received signal peak value detecting circuit 21A exceeds the minimum reference value. As a result, at the position P12 and the following positions, the level of the point A is equal to that of the point B. In the above-mentioned process, at the position P11, the output of the level judging circuit 22 is "H" and the indicator 23 is lit, and thereafter the output of the level judging circuit 22 is "L" and the indicator 23 is in the nonlighting state.

When the oriented position exceeds the position P14 and is then moved to positions P15, P16, and P17 as indicated by an arrow 97, the level of the satellite signal received by the antenna 1 is gradually lowered so that the detection signal is gradually lowered. As shown in B of Table 2, however, the received signal peak value detecting circuit 21A outputs the peak value which is held at the position P14. In this process, therefore, the level of the detection signal is lower than the peak value. As seen from the above-mentioned operation property, the output of the level judging circuit 22 is "H" and the indicator 23 is in the state where the lighting is continuously conducted. This continuous lighting indicates that the peak value of the received signal is held.

When the indicator 23 enters the lighting state as described above, the direction of the movement of the antenna 1 is made opposite along the path 95 as indicated by an arrow 98. In the returning process, as seen from Table 2 and Fig. 7B, at the positions P16 and P15, the level of the detection signal is lower than the peak value, and hence the output of the level judging circuit 22 is "H" so that the indicator 23 maintains the lighting state. When the oriented position reaches the position P14, the level of the detection signal becomes equal to the peak value, and hence the output of the level judging circuit 22 is "L" so that the indicator 23 is not lit. When the oriented position exceeds the point P14 and advances to the positions P13 and P12, the level of the detection signal becomes lower than the signal level of the peak value, and hence the output of the level judging circuit 22 becomes "H" so that the indicator 23 again enters the lighting state.

Therefore, the worker of adjusting the direction of the antenna orients the antenna 1 to the position P14 where the indicator 23 is not lit in the process of returning the direction of the antenna 1, with the result that the antenna 1 is oriented to the optimum reception direction along which the antenna is correctly oriented to the satellite 8. Thereafter, the indicator 23 is not lit only when the oriented position of the antenna 1 coincides with P14. Consequently, the antenna 1 may be oriented to the position P14 after the position is determined as a result of repeating the reciprocal change of the azimuth angle several times. When the antenna 1 is oriented to the best reception direction in this way, the support member 7 is clamped so that the azimuth angle of the antenna 1 is fixed.

Next, the case where the direction of the antenna 1 is adjusted as described above in a district where the reception level of the satellite signal is low will be described. In this case, the received signal from the antenna 1 is lower in level than that in the above-described case as indicated by line B2 in Fig. 7B. In accordance with the degree of the reduction,

therefore, also the values of the signals at the points A and B are lower than those listed in Table 2 as a whole. However, the operations of holding the peak value in the process of changing the direction of the antenna in one direction, judging that the detection signal becomes equal to the held peak value in the process of returning the direction of the antenna, and causing the indicator to operate are the same as those of the above-described case. Therefore, the indicator 23 operates in the strictly same manner as the above-described case. As a result, the antenna 1 can be oriented to the best reception direction along which the antenna is correctly oriented to the satellite 8, in the strictly same manner as the above-described case.

Next, the state attained after the antenna is oriented to the best reception direction and fixed as described above will be described with reference to Table 3.

Table 3

Timing	End of direction adjustment	After elapse of predetermined time period	Thin cloud passes during use
A	40	40	30
B	40	10	10
C	L	L	L
Indicator	●	●	●

When the direction adjustment is ended as described above and the good-indication of the indicator 23 continues for a predetermined time period, the action of the switch over means 76 causes the indicator 23 to enter the state where it performs the good- or failure-indication corresponding to the judgment result of the minimum-reference judging means 17e. When the antenna 1 is oriented to the best reception direction and the indicator 23 enters the nonlighting state, the timer circuit 79 detects the nonlighting state on the basis of the "L" state of the output of the level judging means 22. If the timer circuit 79 judges that the nonlighting state continues for a predetermined time period, the timer circuit 79 sends the stop circuit 80 an instruction of making the switch element 89 turned on. Then the switch element 89 is turned on and the peak-holding capacitor 83 is discharged. As a result, the peak value of the received signal peak value detecting circuit 21A is released and the output of the peak value is stopped. When the output of the peak value is stopped, the minimum reference value of the minimum-reference value producing circuit 75 is given in place of the peak value to the level judging means 22 through the switch circuit 78 (see 10 mV in column B of Table 3). Even when a thin cloud 151 of Fig. 1 passes between the satellite 8 and the antenna 1 under this state and the reception level of the antenna 1 is slightly lowered so that the level of the detection signal is lowered as indicated in Table 3, the level exceeds the minimum reference value, and hence the output of the level judging circuit 22 maintains "L" so that the indicator 23 is kept to be in the nonlighting state. Also when the position of the satellite is temporarily deviated in a small degree and the reception level of the antenna 1 is lowered, the indicator operates in the same manner.

Next, the case where the antenna 1 is fanned by a strong wind in the above-mentioned state and the direction of the antenna is largely deviated to be oriented to a direction along which a received signal of the minimum reception enabled level cannot be obtained will be described with reference to Table 4.

Table 4

Timing	End of direction adjustment	After elapse of predetermined time period	Direction is deviated by strong wind during use
A	40	40	5
B	40	10	10
C	L	L	H
Indicator	●	●	○

In this case, the deviation of the direction of the antenna causes the reception level to be largely lowered. For example, the level of the detection signal is largely lowered to 5 mV as indicated in Table 4. As a result, the level of the detection signal is lower than the minimum reference level, and hence the output of the level judging circuit 22 becomes "H"

so that the indicator 23 is lit. In the above-mentioned case, the quality of a television image due to the satellite signal received by the antenna is very low. The user of the antenna then searches an abnormal portion, and can rapidly know from the lighting of the indicator 23 that the direction of the antenna is abnormal. Consequently, the work of correcting the direction of the antenna can be demanded. In this case, the timer circuit 79 detects the lighting state of the indicator from the change of the output of the level judging means 22 to "H," and stops the instruction to the stop circuit 80. As a result, the stop circuit 80 cancels the stop of the output of the received signal peak value detecting circuit 21A. In the above-mentioned work of correcting the direction of the antenna, therefore, the antenna can be again oriented to the best reception direction depending on the operation of the indicator 23 which is based on the judgement of the best-direction judging means 17d.

Next, the case where it temporarily rains heavily under the above-mentioned state will be described with reference to Table 5.

Table 5

Timing	End of direction adjustment	After elapse of predetermined time period	In use					Elapse of predetermined time period after indication is not lit
			Heavy rain	Weather gradually improves				
A	40	40	5	9	10	20	40	40
B	40	10	10	10	10	20	40	10
C	L	L	H	H	L	L	L	L
Indicator	●	●	○	○	●	●	●	●

In this case, under the state where it rains heavily, the indicator 23 is in the lighting state in the same manner as the above-mentioned case where the direction of the antenna is deviated, and the television image is greatly impaired. As the weather improves, however, the level of the received signal is raised. In accordance with this, also the detection signal and the peak value are raised, so that the indicator 23 enters the nonlighting state and the television image is restored to good quality.

In the embodiment, portions which seem to be identical or equivalent in function to the configuration of the previous embodiment are designated by the same reference numerals as those of the previous embodiment, and duplicated descriptions are omitted. (Also in the next embodiment and the following, similarly, the same reference numerals are used and duplicated descriptions are omitted.)

Fig. 8 shows a further embodiment of the direction adjustment indicating device. In the direction adjustment indicating device, the indicator performs the same indication operation as the embodiment of Fig. 2 during the processes of adjusting the direction of the antenna and fixing the antenna, and the same indication operation as the embodiment of Fig. 5 in the state after the fixing. The direction adjustment indicating device comprises the good-direction judging means 17b and the minimum-reference judging means 17e. The device further comprises the switch over means 76 which switches the means 17b to the means 17e.

In the thus configured direction adjustment indicating device, the states of the points A, B, C in the circuit during the process of first changing the direction of the antenna in one direction along the path 95 of Fig. 7A and then returning the direction of the antenna are as listed in Table 6 below.

Table 6

Positions	P11	P12	P13	P14	P15	P16	P17	P16	P15	P15'	P14	P13'	P13
A	0	10	30	40	30	10	0	10	30	32	40	32	30
B	10	10	24	32	32	32	32	32	32	32	32	32	32
C	H	L	L	L	H	H	H	H	H	L	L	L	H
Indicator	○	●	●	●	○	○	○	○	○	●	●	●	○

As seen from Table 6, in the process of returning the antenna, the indicator is in the nonlighting state which is the good-indication, in the range (the good-reception direction range) between the position P15' which is slightly shifted from the position P15 toward the position P14 and the position P13' which is slightly shifted from the position P13 toward the position P14. Therefore, the antenna is oriented to the best reception direction by orienting the antenna to a substantially center position of the range. In the case where the antenna is to be fixed to the position, when the direction of the antenna is largely deviated to be outside the good-reception direction range between the positions P15' and P13', the indicator enters the lighting state which is the failure-indication. By contrast, when the direction of the antenna is slightly deviated to be within the range, the indicator continues the good-indication.

After the antenna is oriented to the optimum reception direction as described above and then fixed, the direction adjustment indicating device operates in the same manner as the device of Fig. 5.

In the direction adjustment indicating device having the configuration of Fig. 8, in the process of adjusting the direction of the antenna, the level judging means 22 functions as the level judging means of the good-direction judging means 17b. After the antenna is oriented to the optimum reception direction and then fixed, the level judging means 22 functions as the level judging means of the minimum-reference judging means 17e. Namely, the best-direction judging means 17b and the minimum-reference judging means 17e share the level judging means 22. Alternatively, the judging means 17b and 17e may use different level judging means, respectively. In the alternative, indicators which conduct indications respectively corresponding to judgement results of these level judging means may be independently disposed. When the different level judging means are used, the switch over means 76 is not used.

Fig. 9 shows another example of the judgment reference value producing circuit 17c shown in Fig. 2. The judgment reference value producing circuit 17c of the example is configured by the received signal peak value detecting circuit 21A which receives the received signal and detects the peak value in the process of the change of the received signal, and a level reducing circuit 24A which reduces the peak value of the received signal by a constant level and sets the reduced peak level as the judgment reference value. In the example, the received signal peak value detecting circuit 21A first receives the detection signal and holds the peak value of the signal. Then the level reducing circuit 24A receives the held peak value and reduces the level by a predetermined level, thereby producing the judgment reference value.

Fig. 10 shows a further embodiment of the direction adjustment indicating device. The object of the example is to allow, in the work of aligning the direction of the antenna, in order to enable the antenna to be oriented to the best reception direction, the indicator to perform the good-indication only at the position where the peak value is obtained, and, in the fixing work, the indicator to perform the failure-indication only when the direction of the antenna is outside the good-reception direction range. The direction adjustment indicating device comprises the best-direction Judging means 17d and the good-direction judging means 17b. Fig. 10 shows only the portions where modification is performed on the circuit shown in the block circuit diagram of Fig. 2. The example comprises the received signal peak value detecting circuit 21A which holds a peak value of the received signal, in addition to the judgment reference value producing circuit 17c which produces the judgment reference value. The example comprises switching means 33 for selecting one of the judgment reference value produced by the judgment reference value producing circuit 17c and the peak value held by the received signal peak value detecting circuit 21A, and supplying the selected value to the level judging means 22. The switching means can be manually operated from the outside.

When the direction of the antenna is to be adjusted by using the thus configured direction adjustment indicating device, the adjustment of the direction of the antenna is conducted while switching the switching means 33 to the state where the peak value from the received signal peak value detecting circuit 21A is given to the level judging means 22. In this case, only when the received signal received at the input end of the direction adjustment indicating device reaches a peak value, the indicator 23 performs the good-indication. When the direction of the antenna is to be fixed, the switching means 33 is switched so that the judgment reference value from the judgment reference value producing circuit 17c is given to the level judging means 22. Under this state, as described in conjunction with the embodiment of Fig. 2, the received signal received at the input end is compared with the judgment reference value which is lower than the peak value, and the judgment such as that described above and the good- or failure-indication on the basis of the judgment are performed.

Fig. 11 shows a further embodiment of the direction adjustment indicating device. The object of the example is to, when the work of adjusting the direction of the antenna is to be conducted, cause the antenna to be oriented to a direction in a range which is slightly narrower than the good reception region 28 of Figs. 3 and 4B, and, when the direction of the antenna is outside the good reception region 28 in the work of fixing the antenna, allows this to be informed by the failure-indication of the indicator. Fig. 11 shows only the portions where modification is performed on the circuit shown in the block circuit diagram of Fig. 2. The example comprises direction setting reference value producing means 34 which produces a direction setting reference value, in addition to the judgment reference value producing circuit 17c which produces the judgment reference value. The example comprises switching means 37 for selecting one of the judgment reference value produced by the judgment reference value producing circuit 17c and the direction setting reference value produced by the direction setting reference value producing means 34, and supplying the selected value to the level judging means 22. The switching means can be manually operated from the outside. The direction setting

reference value is a reference value which is used only in the operation of adjusting the direction of the antenna, and indicated by the reference numeral Rf2 in Fig. 12. For example, the direction setting reference value Rf2 is determined to be a substantially intermediate value between the peak value of the level of the received signal and the judgment reference value (for example, a level which is lower than the peak level by 0.5 dB). In the same manner as the judgment reference value producing circuit 17c, the direction setting reference value producing means 34 is configured by a level reducing circuit 35 and a reduced-peak value detecting circuit 36.

When the direction of the antenna is to be adjusted by using the thus configured direction adjustment indicating device, the adjustment of the direction of the antenna is conducted while switching the switching means 37 to the state where the direction setting reference value is given to the level judging means 22. In this case, only when the received signal received at the input end of the direction adjustment indicating device becomes equal to or higher than the direction setting reference value, the indicator 23 performs the good-indication. In other words, as indicated by the reference numeral 38 in Fig. 12, the good-indication is performed in a range which is narrower than the good reception region 28. When the range where the indicator 23 performs the good-indication is obtained as described above, a skilled worker orients the direction of the antenna to the vicinity P21 of the center of the range 38. However, a worker who is inexperienced in adjusting of the direction of an antenna sometimes orients the direction of the antenna to, for example, a place P22 which is a corner of the range 38. Even when the direction of the antenna is oriented to such a place P22, it is possible to reduce the possibility that the indicator 23 is caused to perform the failure-indication by deviation of the antenna in the work of fixing the antenna. When the direction of the antenna is to be fixed after the above-mentioned direction adjustment, the switching means 37 is switched so that the judgment reference value is given to the level judging means 22. Then the indicator 23 performs the good-indication in the range 28 which is wider than the range 38. Even when the direction of the antenna is somewhat deviated in the direction of an arrow 39 in the work of fixing the antenna, therefore, the possibility that the direction of the antenna is within the range 28 as indicated by the reference numeral P23 is high. As a result, the possibility that the indicator 23 is caused to perform the failure-indication is low.

Claims

1. An indicating device for adjusting the direction of an antenna for receiving a satellite signal comprising:

a level reducing circuit which receives a received signal from said antenna for receiving a satellite signal, and which produces a level-reduced signal, a level of said level-reduced signal being lower than a level of said received signal by a constant level;
 a reduced-peak-value detecting circuit which detects a peak value of said level-reduced signal, the peak value varying in accordance with a change of the level of said received signal, and which sets the detected peak value as a judgement reference value;
 level judging means for conducting level-judgment on the level of said received signal on the basis of the judgement reference value; and
 an indicator which performs indication corresponding to a judgment result of said level judging means.

2. An indicating device for adjusting the direction of an antenna for receiving a satellite signal comprising:

a received signal peak value detecting circuit which receives a received signal from said antenna for receiving a satellite signal, and which detects a peak value in a process of a change of said received signal;
 a level reducing circuit which lowers the peak value of said received signal by a constant level, and which sets the lowered peak value as a judgement reference value;
 level judging means for conducting level-judgment on the level of said received signal on the basis of the judgement reference value; and
 an indicator which performs indication corresponding to a judgment result of said level judging means.

3. An indicating device for adjusting the direction of an antenna for receiving a satellite signal comprising:

a level reducing circuit which receives a received signal from said antenna for receiving a satellite signal, and which produces a level-reduced signal, a level of said level-reduced signal being lower than a level of said received signal by a constant level;
 a reduced-peak-value detecting circuit which detects a peak value of said level-reduced signal, the peak value varying in accordance with a change of the level of said received signal, and which sets the detected peak value as a judgement reference value;
 a received signal peak value detecting circuit which receives the received signal from said antenna for receiving a satellite signal, and which detects a peak value in a process of a change of said received signal;
 switching means for selecting one of the peak value of said received signal and the minimum reference value;

level judging means for conducting level-judgment on the level of said received signal on the basis of the peak value or the judgement reference value which is selected by said switching means; and
an indicator which performs indication corresponding to a judgment result of said level judging means.

4. An indicating device for adjusting the direction of an antenna for receiving a satellite signal comprising:

a level reducing circuit which receives a received signal from said antenna for receiving a satellite signal, and which produces a level-reduced signal, a level of said level-reduced signal being lower than a level of said received signal by a constant level;

a reduced-peak-value detecting circuit which detects a peak value of said level-reduced signal, the peak value varying in accordance with a change of the level of said received signal, and which sets the detected peak value as a judgement reference value;

direction setting reference value producing means for producing a direction setting reference value having a level which is between the peak value of said received signal and the judgement reference value;

switching means for selecting one of the judgement reference value and the direction setting reference value;

level judging means for conducting level-judgment on the level of said received signal on the basis of the judgement reference value or the direction setting reference value which is selected by said switching means; and
an indicator which performs indication corresponding to a judgment result of said level judging means.

5. An indicating device for adjusting the direction of an antenna for receiving a satellite signal comprising:

best-direction judging means for receiving a received signal from said antenna for receiving a satellite signal, and for producing an output for causing an indicator to perform good- or failure-indication depending on whether a level of the received signal reaches a peak value or not;

an indicator which performs indication corresponding to a judgment result of said best-direction judging means;

minimum-reference judging means for conducting level-judgment on the level of the received signal on the basis of a minimum reference value corresponding to a minimum reception enabled level; and

an indicator which performs indication corresponding to a judgment result of said minimum-reference judging means.

6. An indicating device for adjusting the direction of an antenna for receiving a satellite signal comprising:

a received signal peak value detecting circuit which receives a received signal from said antenna for receiving a satellite signal, and which detects a peak value in a process of a change of said received signal;

a minimum reference value producing circuit which produces a minimum reference value corresponding to a minimum reception enabled level;

switch over means for selecting the detected peak value and the minimum reference value;

level judging means for conducting level-judgment on the level of said received signal on the basis of the peak value or the minimum reference value which is selected by said switch over means; and

an indicator which performs indication corresponding to a judgment result of said level judging means.

7. An indicating device for adjusting the direction of an antenna for receiving a satellite signal comprising:

a level reducing circuit which receives a received signal from said antenna for receiving a satellite signal, and which produces a level-reduced signal, a level of said level-reduced signal being lower than a level of said received signal by a constant level;

a reduced-peak-value detecting circuit which detects a peak value of said level-reduced signal, the peak value varying in accordance with a change of the level of said received signal, and which sets the detected peak value as a judgement reference value;

level judging means for conducting level-judgment on the level of said received signal on the basis of the judgement reference value;

an indicator which performs indication corresponding to a judgment result of said level judging means;

minimum reference judging means for conducting level-judgment on the level of said received signal on the basis of a minimum reference value corresponding to a minimum reception enabled level; and

an indicator which performs indication corresponding to a judgment result of said minimum reference judging means.

FIG.1

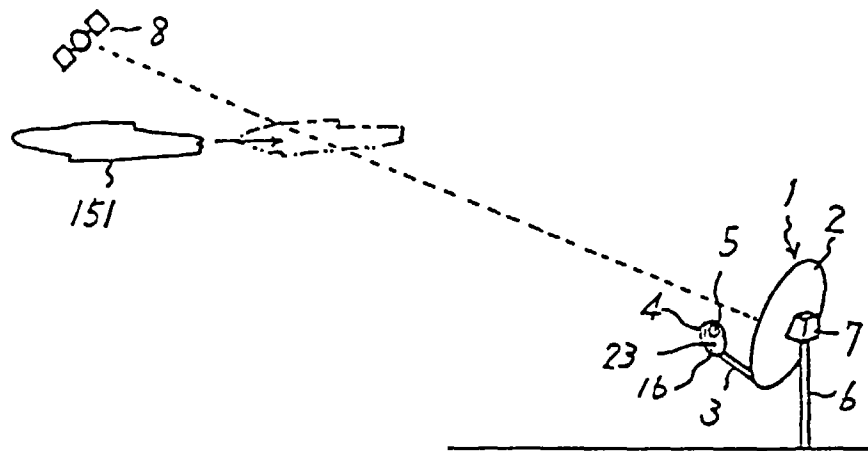


FIG.2

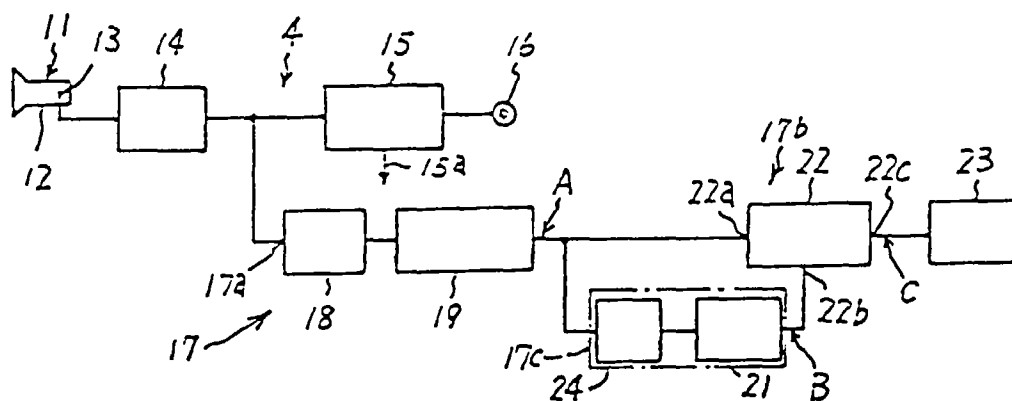


FIG.3

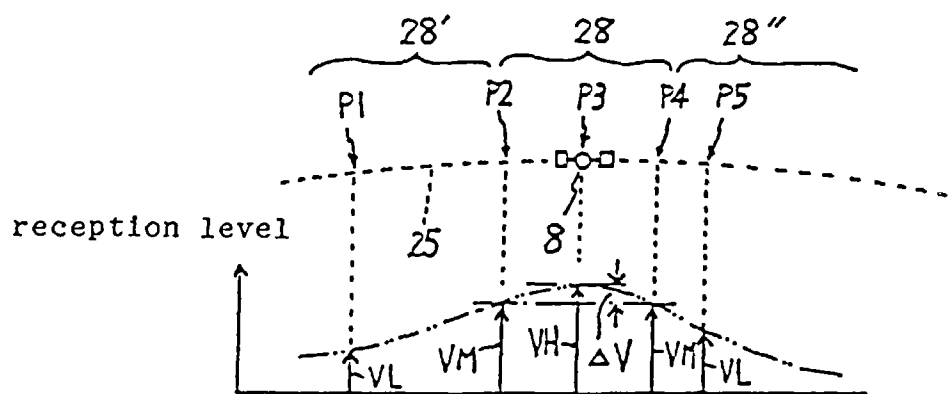


FIG. 4A

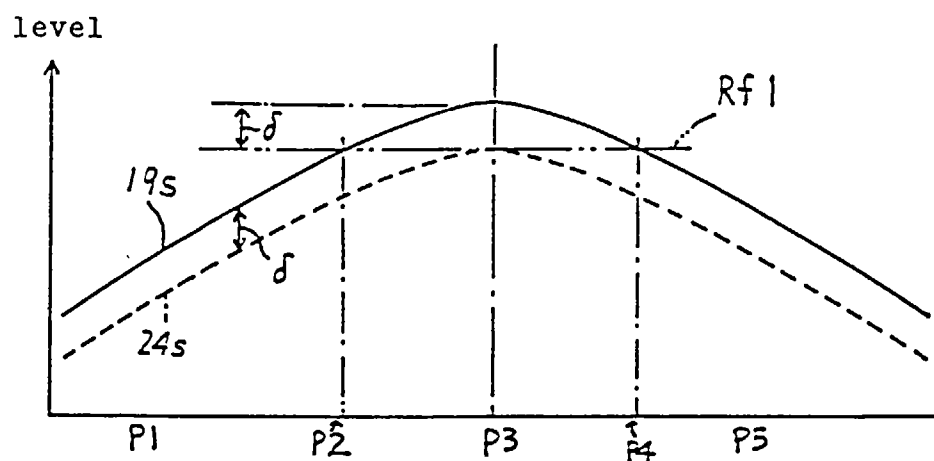


FIG. 4B

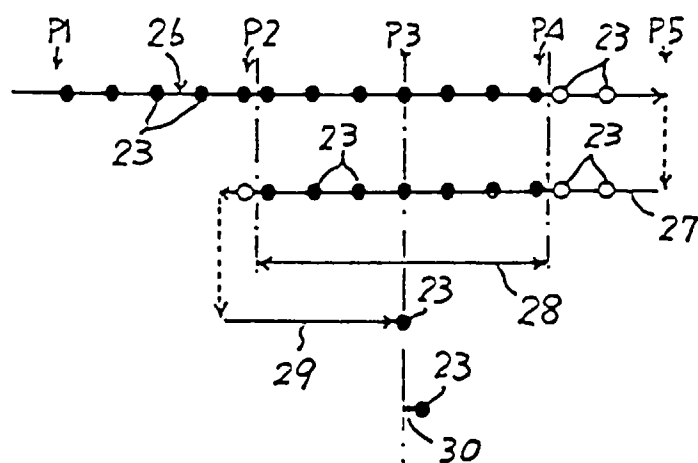


FIG. 5

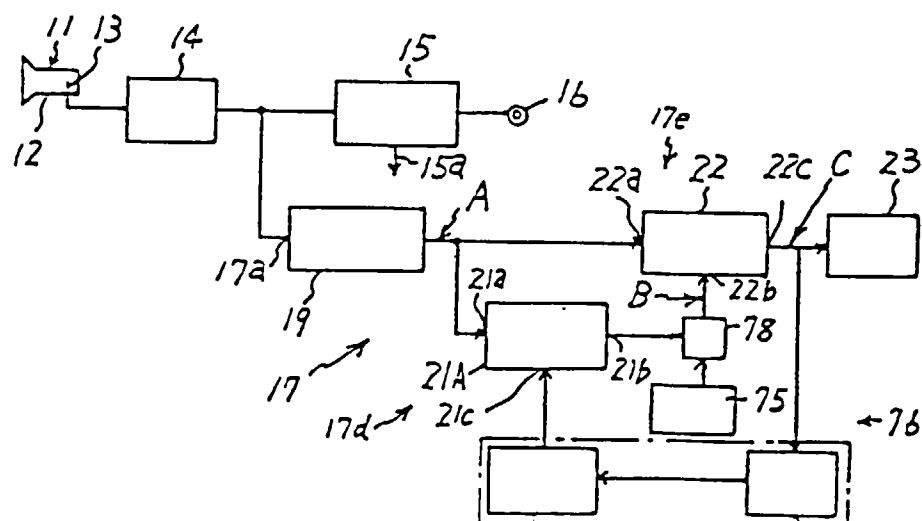


FIG. 6

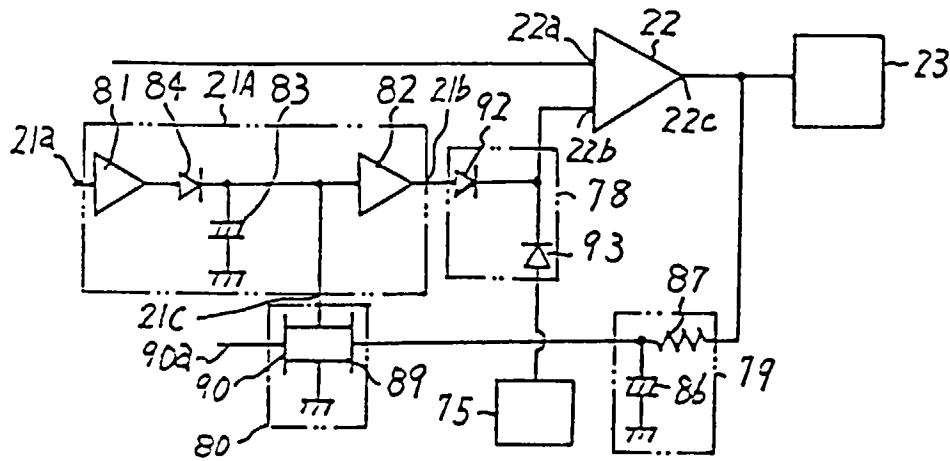


FIG. 7A

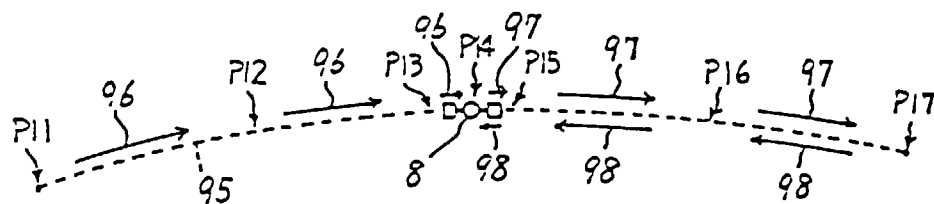


FIG. 7B

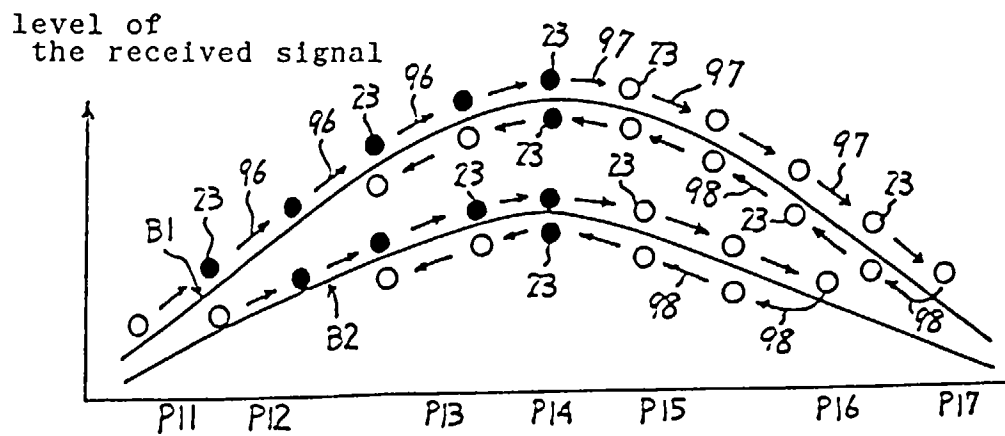


FIG. 8

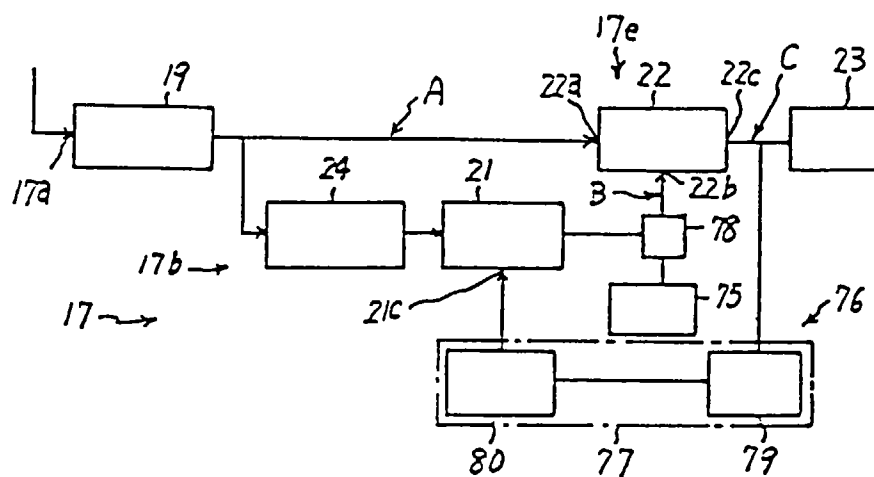


FIG. 9

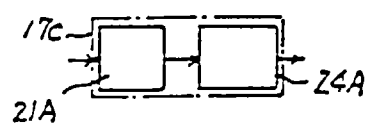


FIG. 10

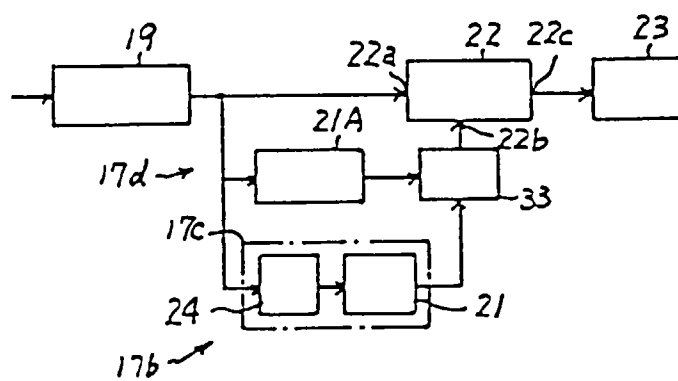


FIG.11

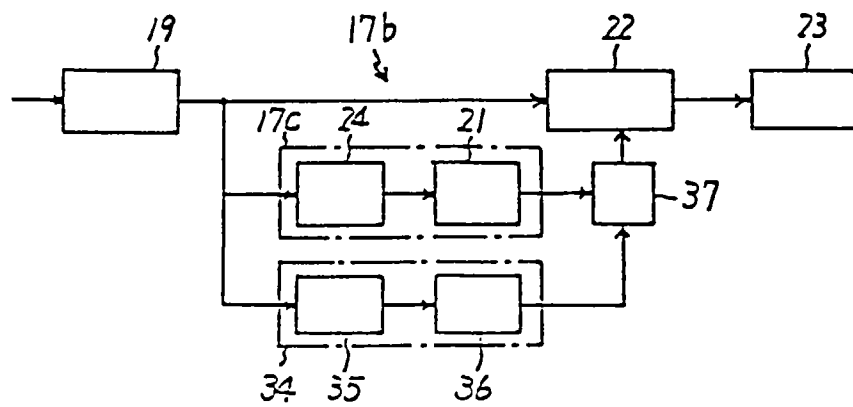
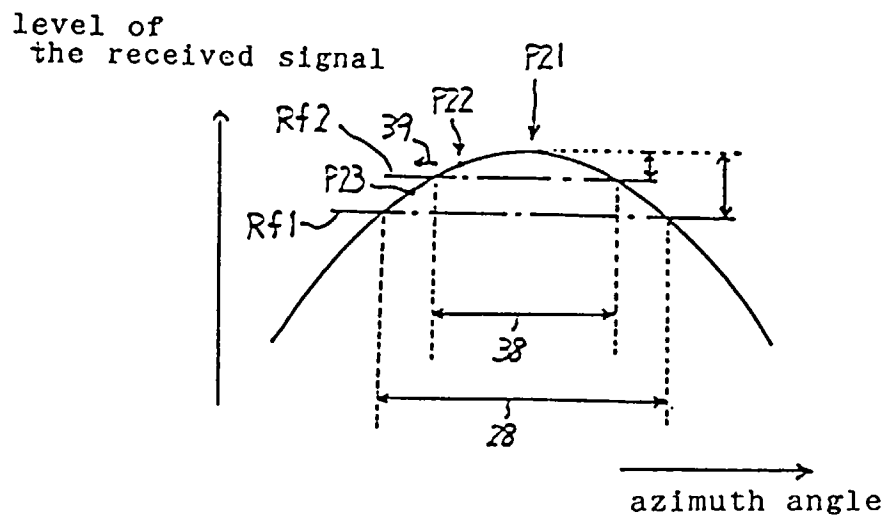


FIG.12



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP95/01611

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl⁶ H01Q3/02

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int. Cl⁶ H01Q3/02, H04B7/155

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

Jitsuyo Shinan Koho 1926 - 1995

Kokai Jitsuyo Shinan Koho 1971 - 1995

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP, 63-74202, A (NEC Corp.), April 4, 1988 (04. 04. 88), Fig. 1 & AU, 7,845,787, A1 & EP, 261,576, A1 & US, 4,881,081, A & AU, 602,005, B2 & CA, 1,287,399, A1 & DE, 3,788,328, T2	1 - 2
Y	JP, 60-22007, U (Sony Corp.), February 15, 1985 (15. 02. 85), Fig. 3 (Family: none)	1 - 2
A	JP, 2-283128, A (Fujitsu General Ltd.), November 20, 1990 (20. 11. 90), Fig. 5 (Family: none)	1 - 7
A	JP, 60-250704, A (DX Antenna Co., Ltd.), December 11, 1985 (11. 12. 85), Fig. 1 (Family: none)	1 - 7
A	JP, 60-260210, A (Matsushita Electric Ind. Co., Ltd.), December 23, 1985 (23. 12. 85),	1 - 7

☒ Further documents are listed in the continuation of Box C.☐ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search
October 25, 1995 (25. 10. 95)Date of mailing of the international search report
November 14, 1995 (14. 11. 95)Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP95/01611

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Fig. 8 (Family: none) JP, 5-48482, U (NEC Home Electronics Co., Ltd.), June 25, 1993 (25. 06. 93), Fig. 1 (Family: none)	1 - 7

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