CLAIMS

1. A position information providing system (10) capable of providing position information by use of a first positioning signal which is a spread spectrum signal from each of a plurality of satellites, comprising an indoor transmitter (200-1), and a position information providing apparatus (100), wherein:

the indoor transmitter includes a storage section (240) which stores therein position data for identifying an installation location of the indoor transmitter, a generation section (210) for generating an second positioning signal including the position data, as a spread spectrum signal, and a transmitting section (292) for transmitting the generated spread spectrum signal; and

the position information providing apparatus includes a receiving section (402) for receiving a spread spectrum signal, an identifying section (412) for, based on a plurality of code patterns related to the first and second positioning signals, identifying one of the code patterns which corresponds to the spread spectrum signal received by the receiving section, a determining section (416) for, based on a signal obtained by demodulating the received spread spectrum signal using the code pattern identified by the identifying section, determining which of the first and second positioning signals is received, a position information-deriving section (430) for deriving position information of the position information providing apparatus, while switching between processing modes depending on a result of the determination, and an output section (440) for outputting the position information derived by the position information-deriving section,

and wherein the second positioning signal is configured to repeat a same content message in a cycle shorter than that of the first positioning signal.

2. The position information providing system as defined in claim 1, wherein the second positioning signal comprises a plurality of frames each including a plurality of words each of which is a transmission unit of data to be subjected to error detection, and wherein:

the number of the words included in each of the frames is variably set; and

the words constituting each of the frames include a word having identification

information indicative of the number of the words constituting the frame.

3. The position information providing system as defined in claim 1 or 2, wherein the second positioning signal comprises a plurality of frames each including a plurality of words each of which is a transmission unit of data to be subjected to error detection, and wherein:

a leading one of the words in each of the frames includes a preamble for establishing frame synchronization during receiving; and

the remaining words other than at least the leading word, in each of the frames, include count data which is updated every time the word data is generated.

4. The position information providing system as defined in any one of claims 1 to 3, wherein:

the first positioning signal comprises a plurality of first frames each including a plurality of first words each of which is a transmission unit of data to be subjected to error detection, each of the first frames including a first preamble for establishing frame synchronization during receiving; and

the second positioning signal comprises a plurality of second frames each including a plurality of second words each of which is a transmission unit of data to be subjected to error detection, each of the second frames including a second preamble for establishing frame synchronization during receiving,

and wherein the second preamble has a pattern different from that of the first preamble.

5. The position information providing system as defined in any one of claims 1 to 4, wherein the position information-deriving section is operable, when the second positioning signal transmitted from the indoor transmitter, to acquire the position data from a signal obtained through the demodulation, and, when a plurality of the first positioning signals are received without receiving the second positioning signal, to calculate the position information based on the plurality of received spread spectrum signals.

6. The position information providing system as defined in claim 2, wherein:

the position information providing apparatus is adapted to be capable of communicating with a communicating apparatus for providing position-related information associated with identification data, via a communication line; and

the position information-deriving section is operable, when the receiving section receives the second positioning signal, to communicate with the communication apparatus based on the identification data to acquire the position-related information associated with the identification data.

7. An indoor transmitter (200-1) capable of providing position information by use of a first positioning signal which is a spread spectrum signal from each of a plurality of satellites, and a second positioning signal compatible with the first positioning signal, comprising:

a first storage section (240) which stores therein position data for identifying an installation location of the indoor transmitter;

a generation section (210) for generating an second positioning signal including the position data, as a spread spectrum signal; and

a transmitting section (292) for transmitting the generated spread spectrum signal,

wherein the generation section is adapted to generate the second positioning signal in such a manner as to repeat a same content message in a cycle shorter than that of the first positioning signal.

8. The indoor transmitter as defined in claim 7, wherein the second positioning signal comprises a plurality of frames each including a plurality of words each of which is a transmission unit of data to be subjected to error detection, and wherein:

the number of the words included in each of the frames is variably set; and

the words constituting each of the frames include a word having identification information indicative of the number of the words constituting the frame.

9. The indoor transmitter as defined in claim 7 or 8, wherein the second positioning signal comprises a plurality of frames each including a plurality of words each of which is a transmission unit of data to be subjected to error detection, and wherein:

a leading one of the words in each of the frames includes a preamble for establishing frame synchronization during receiving; and

the remaining words other than at least the leading word, in each of the frames, include count data which is updated every time the word data is generated.

10. The indoor transmitter as defined in any one of claims 7 to 9, wherein:

the first positioning signal comprises a plurality of first frames each including a plurality of first words each of which is a transmission unit of data to be subjected to error detection, each of the first frames including a first preamble for establishing frame synchronization during receiving; and

the second positioning signal comprises a plurality of second frames each including a plurality of second words each of which is a transmission unit of data to be subjected to error detection, each of the second frames including a second preamble for establishing frame synchronization during receiving,

and wherein the second preamble has a pattern different from that of the first preamble.

11. A method of providing position information by use of a first positioning signal which is a spread spectrum signal from each of a plurality of satellites, comprising:

the step of loading position data for identifying an installation location of an indoor transmitter;

the step of generating an second positioning signal including the position data, as a spread spectrum signal;

the step of transmitting the generated spread spectrum signal;

the step (S610) of receiving the transmitted spread spectrum signal;

the step of, based on a plurality of code patterns related to the first and second positioning signals, identifying one of the code patterns which corresponds to the received spread spectrum signal;

the step (S 612) of, based on a signal obtained by demodulating the received spread spectrum signal using the identified code pattern, determining which of the first and second positioning signals is received;

the step (S620, S630, S640) of deriving position information, while switching between processing modes depending on a result of the determination; and

the step (S650) of outputting the derived position information,

wherein the second positioning signal is generated to repeat a same content message in a cycle shorter than that of the first positioning signal.

12. The method as defined in claim 11, wherein the second positioning signal comprises a plurality of frames each including a plurality of words each of which is a transmission unit of data to be subjected to error detection, and wherein:

the number of the words included in each of the frames is variably set; and

the words constituting each of the frames include a word having identification information indicative of the number of the words constituting the frame.

13. The method as defined in claim 11 or 12, wherein the second positioning signal comprises a plurality of frames each including a plurality of words each of which is a transmission unit of data to be subjected to error detection, and wherein:

a leading one of the words in each of the frames includes a preamble for establishing frame synchronization during receiving; and

the remaining words other than at least the leading word, in each of the frames, include count data which is updated every time the word data is generated.

14. The method as defined in any one of claims 11 to 13, wherein:

the first positioning signal comprises a plurality of first frames each including a

plurality of first words each of which is a transmission unit of data to be subjected to error detection, each of the first frames including a first preamble for establishing frame synchronization during receiving; and

the second positioning signal comprises a plurality of second frames each including a plurality of second words each of which is a transmission unit of data to be subjected to error detection, each of the second frames including a second preamble for establishing frame synchronization during receiving,

and wherein the second preamble has a pattern different from that of the first preamble.

15. The method as defined in any one of claims 11 to 14, wherein the step of deriving includes the sub-step of, when the second positioning signal transmitted from the indoor transmitter, acquiring the position data from a signal obtained through the demodulation, and the sub-step of, when a plurality of the first positioning signals are received without receiving the second positioning signal, calculating the position information based on the plurality of received spread spectrum signals.

CLAIMS

1. A position information providing system capable of providing position information by use of a first positioning signal which is a spread spectrum signal from each of a plurality of satellites, comprising an indoor transmitter, and a position information providing apparatus, wherein:

the indoor transmitter includes:

a storage section which stores therein position data for identifying an installation location of the indoor transmitter,

a generation section for generating an second positioning signal including the position data, as a spread spectrum signal,

and a transmitting section for transmitting the generated spread spectrum signal; and

the position information providing apparatus includes:

a receiving section for receiving a spread spectrum signal,

an identifying section for, based on a plurality of code patterns related to the first and second positioning signals, identifying one of the code patterns which corresponds to the spread spectrum signal received by the receiving section,

a determining section for, based on a signal obtained by demodulating the received spread spectrum signal using the code pattern identified by the identifying section, determining which of the first and second positioning signals is received,

a position information-deriving section for deriving position information of the position information providing apparatus, while switching between processing modes depending on a result of the determination, and

an output section for outputting the position information derived by the position information-deriving section,

wherein the second positioning signal is configured to repeat a same content message in a cycle shorter than that of the first positioning signal,

wherein the second positioning signal comprises a plurality of frames each including a one or more words, each of which is a transmission unit of data to be subjected to error detection, and

wherein:

the number of the words included in each of the frames is variably set,

a leading one of the words in each of the frames includes a preamble for establishing frame synchronization during receiving,

the leading one of the words in each of the frames comprises a message-type identification information indicative of the number of the words constituting the frame, and further indicative of whether the frame includes position information or other information, and

if the frames include more than one word, the remaining one or more words other than at least the leading word, in each of the frames, include count data which is updated every time the word data is generated.

2. The position information providing system as defined in claim **1**, wherein:

the first positioning signal comprises a plurality of first frames each including a plurality of first words each of which is a transmission unit of data to be subjected to error detection, each of the first frames including a first preamble for establishing frame synchronization during receiving; and

the second positioning signal comprises a plurality of second frames each including a plurality of second words each of which is a transmission unit of data to be subjected to error detection, each of the second frames including a second preamble for establishing frame synchronization during receiving, and

wherein the second preamble has a pattern different from that of the first preamble.

3. The position information providing system as defined in claim **1**, wherein the position information-deriving section is operable, when the second positioning signal transmitted from the indoor transmitter, to acquire the position data from a signal obtained through the demodulation, and, when a plurality of the first positioning signals are received without receiving the second positioning signal, to calculate the position information based on the plurality of received spread spectrum signals.

4. The position information providing system as defined in claim 1, wherein:

the position information providing apparatus is adapted to be capable of communicating with a communicating apparatus for providing position-related information associated with identification data, via a communication line; and

the position information-deriving section is operable, when the receiving section receives the second positioning signal, to communicate with the communication apparatus based on the identification data to acquire the position-related information associated with the identification data.

5. An indoor transmitter capable of providing position information by use of a first positioning signal which is a spread spectrum signal from each of a plurality of satellites, and a second positioning signal compatible with the first positioning signal, comprising:

a first storage section which stores therein position data for identifying an installation location of the indoor transmitter;

a generation section for generating an second positioning signal including the position data, as a spread spectrum signal; and

a transmitting section for transmitting the generated spread spectrum signal,

wherein the generation section is adapted to generate the second positioning signal in such a manner as to repeat a same content message in a cycle shorter than that of the first positioning signal,

wherein the second positioning signal comprises a plurality of frames each including a one or more words, each of which is a transmission unit of data to be subjected to error detection, and

wherein:

the number of the words included in each of the frames is variably set,

a leading one of the words in each of the frames includes a preamble for establishing frame synchronization during receiving,

the leading one of the words in each of the frames comprises a message-type identification information indicative of the number of the words constituting the frame, and further indicative of whether the frame includes position information or other information, and

if the frames include more than one word, the remaining one or more words other than at least the leading word, in each of the frames, include count data which is updated every time the word data is generated.

6. The indoor transmitter as defined in claim **5**, wherein:

the first positioning signal comprises a plurality of first frames each including a plurality of first words each of which is a transmission unit of data to be subjected to error detection, each of the first frames including a first preamble for establishing frame synchronization during receiving; and

the second positioning signal comprises a plurality of second frames each including a plurality of second words each of which is a transmission unit of data to be subjected to error detection, each of the second frames including a second preamble for establishing frame synchronization during receiving, and

wherein the second preamble has a pattern different from that of the first preamble.

7. The indoor transmitter as defined in claim **5**, wherein the generation section includes identification data associated with position-related information.

8. The indoor transmitter as defined in claim **5**, wherein:

the first positioning signal comprises a plurality of first frames each including a plurality of first words each of which is a transmission unit of data to be subjected to error detection, each of the first frames including a first preamble for establishing frame synchronization during receiving; and

the second positioning signal comprises a plurality of second frames each including a plurality of second words

each of which is a transmission unit of data to be subjected to error detection, each of the second frames including a second preamble for establishing frame synchronization during receiving, and

wherein the second preamble has a pattern different from that of the first preamble.

9. A method of providing position information by use of a first positioning signal which is a spread spectrum signal from each of a plurality of satellites, comprising:

the step of loading position data for identifying an installation location of an indoor transmitter;

the step of generating an second positioning signal including the position data, as a spread spectrum signal;

the step of transmitting the generated spread spectrum signal;

the step of receiving the transmitted spread spectrum signal;

the step of, based on a plurality of code patterns related to the first and second positioning signals, identifying one of the code patterns which corresponds to the received spread spectrum signal;

the step of, based on a signal obtained by demodulating the received spread spectrum signal using the identified code pattern, determining which of the first and second positioning signals is received;

the step of deriving position information, while switching between processing modes depending on a result of the determination; and

the step of outputting the derived position information,

wherein the second positioning signal is generated to repeat a same content message in a cycle shorter than that of the first positioning signal,

wherein the second positioning signal comprises a plurality of frames each including a one or more words, each of which is a transmission unit of data to be subjected to error detection, and

wherein:

the number of the words included in each of the frames is variably set,

a leading one of the words in each of the frames includes a preamble for establishing frame synchronization during receiving,

the leading one of the words in each of the frames comprises a message-type identification information indicative of the number of the words constituting the frame, and further indicative of whether the frame includes position information or other information, and

if the frames include more than one word, the remaining one or more words other than at least the leading word, in each of the frames, include count data which is updated every time the word data is generated.

10. The method as defined in claim **9**, wherein:

the first positioning signal comprises a plurality of first frames each including a plurality of first words each of which is a transmission unit of data to be subjected to error detection, each of the first frames including a first preamble for establishing frame synchronization during receiving; and

the second positioning signal comprises a plurality of second frames each including a plurality of second words each of which is a transmission unit of data to be subjected to error detection, each of the second frames including a second preamble for establishing frame synchronization during receiving, and

wherein the second preamble has a pattern different from that of the first preamble.

11. The method as defined in claim **10**, wherein the step of deriving includes the sub-step of, when the second positioning signal transmitted from the indoor transmitter, acquiring the position data from a signal obtained through the demodulation, and the sub-step of, when a plurality of the first positioning signals are received without receiving the second positioning signal, calculating the position information based on the plurality of received spread spectrum signals.

12. The method as defined in claim **9**, wherein the step of deriving includes the sub-step of, when the second positioning signal transmitted from the indoor transmitter, acquiring the position data from a signal obtained through the demodulation, and the sub-step of, when a plurality of the first positioning signals are received without receiving the second positioning signal, calculating the position information based on the plurality of received spread spectrum signals.