CLAIMS

1. A navigation message authentication type positioning apparatus ~~(200, 300)~~, comprising:

a satellite receiver ~~(230, 330)~~ that receives a navigation message from an artificial satellite used in a satellite positioning system;

an authentication information acquisition portion ~~(S25)~~ that acquires, from an authentication center, authentication information in accordance with the navigation message received from the artificial satellite;

an authentication portion ~~(S29 to S31)~~ that authenticate that the navigation message received by the satellite receiver ~~(230, 330)~~ is authentic, by using the authentication information acquired by the authentication information acquisition portion ~~(S25)~~;

a positioning portion ~~(S42)~~ that determines a position of the navigation message authentication type positioning apparatus based on the navigation message received by the satellite receiver ~~(230, 330)~~ from a plurality of artificial satellites;

an evaluation value specification portion ~~(S3, S3a, S3b, S64, S83)~~ that specifies a signal quality evaluation value that evaluates a signal quality of the navigation message received by the satellite receiver ~~(230, 330)~~; and

a selection portion ~~(S5, S41, S68, S85, S88)~~ that selects, based on the signal quality evaluation value specified by the evaluation value specification portion ~~(S3, S3a, S3b, S64, S83)~~ and from among the artificial satellites from which the satellite receiver ~~(230, 330)~~ has successfully received the navigation message, the artificial satellite that has transmitted the navigation message having the signal quality that is rated excellent,

wherein:

the authentication information acquisition portion ~~(S25)~~ acquires only the authentication information in accordance with the navigation message received from the artificial satellite selected by the selection portion ~~(S5, S41, S68, S85, S88)~~;

the authentication portion ~~(S29 to S31)~~ authenticates that the navigation message received by the satellite receiver ~~(230, 330)~~ from the artificial satellite selected by the selection portion ~~(S5, S41, S68, S85, S88)~~ is

authentic, by using the authentication information acquired by the authentication information acquisition portion ~~(S25)~~; and

the positioning portion ~~(S42)~~ determines the position of the navigation message authentication type positioning apparatus ~~(200, 300)~~ based on the navigation message received from the artificial satellite selected by the selection portion ~~(S5, S41, S68, S85, S88)~~.

2. The navigation message authentication type positioning apparatus according to claim 1, wherein:

the selection portion ~~(S85, S88)~~ selects, based on the signal quality evaluation value specified by the evaluation value specification portion ~~(S83)~~ and from among the artificial satellites from which the satellite receiver ~~(230, 330)~~ has successfully received the navigation message, a predetermined plurality of the artificial satellites having transmitted the navigation message having the signal quality that is rated as more excellent in decreasing order of signal quality.

3. The navigation message authentication type positioning apparatus according to claim 1 or 2, wherein:

the evaluation value specification portion ~~(S3, S83)~~ specifies, as the signal quality evaluation value, a signal-to-noise ratio of the navigation message received by the satellite receiver ~~(230, 330)~~.

4. The navigation message authentication type positioning apparatus according to any one of claims 1 to 3, wherein:

the evaluation value specification portion ~~(S3a)~~ specifies, as the signal quality evaluation value, an elevation angle of the artificial satellite determined by using orbit information of the artificial satellite included in the navigation message received by the satellite receiver ~~(230, 330)~~.

5. The navigation message authentication type positioning apparatus according to any one of claims 1 to 4, wherein:

the evaluation value specification portion ~~(S3b)~~ specifies, as the signal quality evaluation value, a difference between

a geometric distance between the artificial satellite and the navigation message authentication type positioning apparatus ~~(200, 300)~~, the geometric distance being obtained by using orbit information of the artificial satellite included in the navigation message received by the satellite receiver ~~(230, 330)~~ and

a pseudo-distance between the artificial satellite and the navigation message authentication type positioning apparatus ~~(200, 300)~~, the pseudo-distance being determined from a propagation time of the navigation message received by the satellite receiver ~~(230, 330)~~.

6. The navigation message authentication type positioning apparatus according to any one of claims 1 to 5, further comprising:

a transmission portion ~~(212)~~ that transmits to an outside of the navigation message authentication type positioning apparatus ~~(200)~~, information including

identification information that identifies the artificial satellite selected by the selection portion ~~(S5, S41)~~ and

the authentication information about the artificial satellite selected by the selection portion ~~(S5, S41)~~ showing whether authentication has succeeded in the authentication portion ~~(S29 to S31)~~.

7. The navigation message authentication type positioning apparatus according to any one of claims 1 to 6, further comprising:

a reception portion ~~(311)~~ that receives information transmitted from a different navigation message authentication type positioning apparatus ~~(200)~~, which is different from the navigation message authentication type positioning apparatus ~~(300)~~, the information including

identification information that identifies the artificial satellite selected by the selection portion ~~(S5, S41)~~ of the different navigation message authentication type positioning apparatus ~~(200)~~ and

the authentication information about the artificial satellite selected by the selection portion ~~(S5, S41)~~ showing whether authentication has succeeded in the authentication portion ~~(S29 to S31)~~ of the different navigation message authentication type positioning apparatus ~~(200)~~,

wherein:

the selection portion ~~(S68)~~ of the navigation message authentication type positioning apparatus ~~(300)~~ preferentially selects the artificial satellite that has succeeded in the authentication of the navigation message in the different navigation message authentication type positioning apparatus ~~(200)~~ based on the identification information and the authentication information, which are received by the reception portion ~~(311)~~.