Appeal decision

Appeal No. 2017-16683

Tokyo, Japan
Appellant NEC Corporation

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The case of appeal against the examiner's decision of refusal of Japanese Patent Application No. 2014-63180, entitled "PROBE DEVICE, MEASUREMENT METHOD, AND PROGRAM", [the application published on Oct. 22, 2015, Japanese Unexamined Patent Application Publication No. 2015-184235] has resulted in the following appeal decision:

Conclusion

The appeal of the case was groundless.

Reason

No. 1 History of the procedures

The application related to this appeal case (hereinafter, referred to as "The Present Application") is a patent application that was filed on Mar. 26, 2014. Then, an amendment regarding the scope of claims was made on Apr. 20, 2017, a decision of refusal (hereinafter, referred to as "Examiner's decision") was made as of Jul. 26 of the same year, and a copy of the original of the Examiner's decision was delivered on Aug. 22 of the same year.

Against this, an appeal against the examiner's decision of refusal was requested on Nov. 9 of the same year, and, at the same time, an amendment regarding the scope of claims (hereinafter, referred to as "the Amendment") was made.

No. 2 Decision to dismiss the amendment

[Conclusion of Decision to Dismiss Amendment]

The Amendment shall be dismissed.

[Reason for Decision to Dismiss Amendment]

As will be described below, the Amendment falls under the category of an amendment for restriction of the scope of claims prescribed in Article 17-2(5)(ii) of the Patent Act and for the purpose of correction of errors prescribed in Article 17-2(5)(iii) of the same Act. However, the invention according to claim 10 after the Amendment falls under Article 29(1)(iii) of the same Act, and the appellant should not be granted a patent for the invention independently at the time of patent application, and, therefore, the Amendment violates the provisions of Article 126(7) of the same Act as applied mutatis mutandis pursuant to the provisions of Article 17-2(6) of the same Act, and, thus, should be dismissed under the provisions of Article 53(1) of the same Act which is applied mutatis mutandis pursuant to the provisions of Article 159(1) of the same Act.

1 Details of the Amendment

The Amendment includes an amendment regarding claim 10 of the scope of claims.

The statement of claim 10 before the Amendment (this means the statement after the amendment made on Apr. 20, 2017; the same shall apply hereinafter) and that after the Amendment are as follows. The underlines were given by this collegial body in order to show amended portions.

(1) Before the Amendment

"[Claim 10]

A probe method, comprising:

generating different kinds of the probe waves that are transmission pulses by combining a plurality of sound waves having different characteristics, and transmitting those waves in series;

receiving reflected waves of the probe waves; and

processing the reflected waves received by the transmission and reception wave section."

(2) After the Amendment

"[Claim 10]

<u>A probe method in a sonar device</u>, comprising:

generating different kinds of the probe waves that are transmission pulses by combining a plurality of sound waves having different characteristics, and transmitting those waves in series <u>at a sampling rate depending on a number of the different kinds</u>;

receiving reflected waves of the probe waves; and

processing <u>the received reflected waves</u>."

2 Purpose of Amendment

Within the Amendment, the amendment regarding claim 10 is an amendment to: add limitation to the effect that "probe method" is "in a sonar device"; add limitation to the effect that "sampling rate" on the occasion of " generating different kinds of the probe waves, and transmitting those waves in series " is a rate "depending on a number of the different kinds"; and correct the error of "the reflected waves received by the transmission and reception wave section" to "the received reflected wave" which from context obviously is to be an original description.

Therefore, within the Amendment, the amendment regarding claim 10 falls under the category of ones for the purpose of restriction of the scope of claims prescribed in Article 17-2(5)(ii) of the Patent Act and correction of errors prescribed in Article 17-2(5)(iii) of the Patent Act.

Then, whether or not the invention according to claim 10 after the Amendment (hereinafter, referred to as "the Amended Invention") is one for which the appellant could be granted a patent independently at the time of filing of the patent application (whether or not the Amendment satisfies so-called independent requirements for patentability) will be discussed below.

3 Judgment on independent requirements for patentability

(1) Invention described in Cited Document 1

A Japanese Unexamined Patent Application Publication No. 2006-284257 (hereinafter, referred to as "Cited Document 1") is a published unexamined patent publication having the publication date of Oct. 19, 2006 which is before the application date of the Present Application, and is a document cited in the reasons for refusal stated in the examiner's decision.

B In Cited Document 1, there are the following statements. Underlines were added by this collegial body.

"[Technical Field]

[0001]

<u>The present invention relates to</u> a method and apparatus for estimating a propagation distance of a sound-wave, and, particularly, to <u>a method</u> and apparatus<u> for estimating a propagation distance of a sound-wave, which use a difference in propagation attenuation by frequencies and are able to perform long-distance search of an underwater object efficiently while performing short-distance search at the same time</u>.

[Background Art]

[0002]

<u>As a search method of an underwater object</u>, <u>a method according to active sonar</u> in which an existence position of the object is identified <u>is common,</u> by transmitting probe waves in the water, receiving and analyzing reflected waves that return to the transmission point from an underwater object (for example, refer to Patent Document 1). <u>For this reason, on the occasion of searching an underwater object, it will be such that sound waves are repeatedly transmitted at constant time intervals, and received sound waves are analyzed to search for reflected waves from an underwater object</u>.

[0003]

When searching an underwater object existing at a long distance, it is necessary to secure transmission time intervals sufficiently long in consideration of a time during which sound waves that propagate to a far distance hit an underwater object to be reflected and, then, return to the transmission point, and transmit the sound waves on high power also taking attenuation due to propagation into consideration. On the other hand, when searching an underwater object existing at a short distance, low power sound waves will be transmitted at relatively short time intervals.

[0004]

In particular, in the case of an underwater object having a very small reflected sound such as a floating matter and the like, although a reflected wave cannot be detected at all from a long distance, a reflected wave is detected after the underwater object comes to an extremely short distance and, as a result, a ship is not able to perform operation such as collision avoidance operation. For this reason, in water areas within which it is predicted that there exist underwater objects of small reflected sounds such as floating matters and the like, it is necessary to search objects by transmitting sound waves at short time intervals."

[Problem to be solved by the invention]

[0006]

However, when there exists a very large underwater object at a long distance, if sound waves are transmitted at short time intervals in order to search underwater objects at a short distance, there is a possibility that a sound wave transmitted in the past (1 cycle to n cycles earlier) has propagated far and hits a long-distance underwater object, and, then, its reflected wave is received with intensity capable of being sufficiently detected even at the transmission point. In this case, it is not possible to distinguish between a reflected wave from a short-distance underwater object in response to a sound wave that has been just transmitted and a reflected wave from a long-distance underwater object in response to a sound wave that has been transmitted in the past (1 cycle to n cycles earlier) and has propagated far.

[0007]

For this reason, during short-distance search, a position of a long-distance underwater object cannot be obtained, and, in addition, its existence cannot be recognized. Furthermore, there is a possibility that a reflected wave from a long-distance underwater object is regarded as a reflected wave from a short-distance underwater object in response to a sound wave that has just been transmitted, and the underwater object is falsely detected at a position (short distance) at which the underwater object does not exist in reality.

[0008]

The present invention has been made in consideration of the above point, and an purpose of the present invention is to provide a method and apparatus for estimating a propagation distance of a sound-wave, which use a difference in propagation attenuation by frequencies and are able to perform long-distance search efficiently while performing short-distance search at the same time.

[0009]

In addition, another purpose of the present invention is to provide a method and apparatus for estimating a propagation distance of a sound wave, which can reject false detection due to a reflected wave from a long-distance underwater object during short-distance search.

[Means for solving the problem]

...(Omitted)...

[0013]

Furthermore, in order to achieve the above purposes, a method of the present invention includes: a first step of transmitting into water a plurality of sound waves made by combining sound waves composed of a plurality of frequency bands different from each other in a different order in a manner of switching at a set time interval cyclically; a second step of performing phase regulating addition of electric signals obtained by receiving sound waves from the water and performing acoustoelectric conversion to synthesize a directional beam for each direction and output an analyzing signal for each direction; a third step of calculating correlation between an analyzing signal and a transmission waveform to determine, from a result of the correlation, whether a received reflected wave is a reflected wave from an underwater object in response to which sound wave of the plurality of sound waves transmitted in the first step; and a fourth step of estimating an approximate estimate distance to an underwater object by estimating a rough propagation time of the received reflected wave from a difference in a propagation attenuation rate of the reflected wave by frequencies determined in the third step."

"[Advantage of the Invention]
[0029]

According to the present invention, since it is possible to obtain a position of an underwater object also from a reflected wave in response to a sound wave transmitted in the past (1 to n cycles earlier), it is possible to search a short distance and a long distance at the same time by shortening a transmission interval. Therefore, it is possible to perform short-distance search and long-distance search at the same time efficiently, and false detection due to a reflected wave from a long-distance underwater object during short-distance search, which is a problem to be solved conventionally, can be rejected, and it is possible to detect an underwater object at a short distance with certainty."

"[0058]
(Second embodiment)

Next, a second embodiment of the present invention will be described. The present embodiment is different from the first embodiment in a point that, <u>by performing transmission in a manner combining a low frequency wave and a high-frequency wave in turn and switching their order</u> as shown in FIG. 5(A) instead of using two types of transmission waveform patterns of an up chirp and a down chirp, <u>the pattern of a transmission waveform is changed</u>.
[0059]

The device configuration of the present embodiment is the same as the device configuration of the first embodiment, and is illustrated by the block diagram of FIG. 1. In this regard, however, only the transmission frequency setting section 110 and the reflected wave detector 420 in FIG. 1 have particular constitutions of the present embodiment. That is, the transmission frequency setting section 110 sets a pattern of a transmission waveform and its frequency for each transmission cycle. The transmission waveform, as indicated by S3 and S4 in FIG. 5 (A), is made to be of two patterns of a waveform (S3) transmitted in order of a low frequency wave and a high frequency wave, and a waveform (S4) transmitted in order of a high frequency wave and a low frequency wave. As the frequencies, two frequencies of a low frequency and a high frequency are set.
[0060]

In addition, the reflected wave detector 420 detects a reflected wave from an underwater object existing in an analyzing signal, from a result of a correlation processing section 410, and determines, in response to which one of the transmission waveforms of waveform (S3) transmitted in order of the low frequency wave and the high frequency wave or waveform (S4) transmitted in order of the high frequency wave and the low frequency wave has been detected, in response to that the reflected wave has been caused.
[0061]

Next, operations in the second embodiment of the present invention will be described. The operations in the present embodiment are similar to the operations in the first embodiment essentially (refer to FIG. 2 and FIG. 3). In this regard, however, the processing of step A1 in FIG. 2 and analysis processing D1-Dn of the analyzing unit 400 differ from those of the first embodiment.

[0062]

That is, in step A1, setting of a waveform to be transmitted is performed by the transmission setting unit 100. On this occasion, in the present embodiment, transmission is arranged so as to make the waveform be S3 (a waveform transmitted in order of a low frequency wave and a high frequency wave) in an odd-numbered transmission and be S4 (a waveform transmitted in order of a high frequency wave and a low frequency wave) in transmission before an even-numbered transmission (note by the collegial body: the error of "in an even-numbered transmission") one after the other (refer to FIG. 5 (A)). Here, in step A1, the frequencies of the high frequency wave and the low frequency wave are also set.

[0063]

As a result, a change is caused in the processing of the analyzing unit 400. Therefore, the processing of the processing step Dm of the analyzing unit 400; that is, operations of the present embodiment in the portion of step F1 to step F7 of FIG. 3, will be described.

[0064]

(3) First, processing in a case where the m-th transmission (step Bm in FIG. 2) is an odd-numbered transmission will be described. In this case, the transmission unit 200 will transmit S3 (a waveform transmitted in order of a low frequency wave and a high frequency wave) in the m-th transmission (step Bm in FIG. 2) (refer to FIG. 5 (A)).

[0065]

In the beginning, the analyzing unit 400 performs correlation processing between an analyzing signal for each direction and a theoretical reflection waveform in response to each of the transmission waveforms of S3 (a waveform transmitted in order of a low frequency wave and a high frequency wave) and S4 (a waveform transmitted in order of a high frequency wave and a low frequency wave) (step F1 in FIG. 3). Next, as a result of the processing of step F1, signals of portions for which correlation with a theoretical reflection waveform in response to the transmission waveform of S3 (a waveform transmitted in order of a low frequency wave and a high frequency wave) or S4 (a waveform transmitted in order of a high frequency wave and a low frequency wave) exceeds a threshold are extracted (step F2 in FIG. 3). Hereinafter, a signal of a portion for which such correlation processing exceeds the threshold is called a reflected wave from an underwater object.

[0066]

Next, an intensity ratio between the high frequency component and the low frequency component of the reflected wave extracted in step F2 is calculated, and the intensity ratio is compared with a theory value of a propagation attenuation difference by frequencies or a database prepared in advance, and a rough propagation time and propagation distance are calculated (step F3 in FIG. 3). By this, as shown in FIG. 5 (B), for example, when a reflected wave received by the receiving unit 300 is a reflected wave in response to S3 (a waveform transmitted in order of the low frequency wave and the high-frequency wave) of the m-th transmission and its attenuation difference depending on frequencies is small, it is presumed that the reflected wave is a reflected wave from a short-distance underwater object. In addition, when a reflected wave in response to S4 (a waveform transmitted in order of a high frequency wave and a low frequency wave) of the (m-1)-th transmission is received and its attenuation difference depending on frequencies is of a middle level, it is presumed that the reflected wave is a reflected wave from a medium-distance underwater object. Furthermore, when a reflected wave in response to S3 (a waveform transmitted in order of a low frequency wave and a high frequency wave) of the (m-2)-th transmission is received and the attenuation difference of the reflected wave depending on frequencies is large, it is presumed that the reflected wave is a reflected wave from a long-distance underwater object.

[0067]

Next, after calculating an estimated transmission time by subtracting the propagation time calculated in step F3 from the reception time of the reflected wave (step F4 in FIG. 3), when, regarding the correlation processing result in step F1, correlation processing with S3 has exceeded the threshold, the transmission wave determination section 440 performs the processing of (3-1) to be hereinafter described, or, when correlation processing with S4 has exceeded the threshold, performs processing of (3-2) to be hereinafter described (step F5 in FIG. 3).

[0068]

(3-1) When correlation processing with S3 (a waveform transmitted in order of a low frequency wave and a high frequency wave) exceeds the threshold, as a result of the processing of the above-mentioned step F1, the received reflected wave is a reflected wave in response to the m-th transmission (step Bm in FIG. 2) or an even-numbered transmission performed before the m-th transmission (step B[m-2k] (k=1, 2, 3, ...) in FIG. 2). Therefore, the transmission wave determination section 440 determines to which of the transmission time of the m-th transmission (step Bm in FIG. 2) and the even-numbered transmission before that (step B[m-2k] (k=1, 2, 3, ...) in FIG. 2) the estimated transmission time calculated in step F4 is proximate (step F5 in FIG. 3).

[0069]

(3-2) On the other hand, whencorrelation processing with S4 (a waveform transmitted in order of a high frequency wave and a low frequency wave) exceeds the threshold, as a result of processing of the above-mentioned step F1 the received reflected wave is a reflected wave in response to an odd-numbered transmission (step B[m-(2k-1)] (k=1, 2, 3, ...) in FIG. 2) before the m-th transmission (step Bm in FIG. 2). Therefore, the transmission wave determination section 440 determines to which of the transmission time of an odd-numbered transmission (step B[m-(2k-1)] (k=1, 2, 3, ...) in FIG. 2) before the m-th transmission (step Bm in FIG. 2) the estimated transmission time calculated in step F4 is proximate (step F5 in FIG. 3).

[0070]

By the determination in the above step F5, it can be determined that the reflected wave in question is a reflected wave in response to which transmission, and, therefore, the distance calculating section 450 calculates the distance to an underwater object forming the reflected wave from the transmission time of the transmission in question and the reception time of the reflected wave (step F6 in FIG. 3). Next, the position estimating section 460 estimates the position of the underwater object in question, from the distance to the underwater object calculated in step F6 and the direction of an analyzing signal currently under analysis and output the position on the display unit 500 (step F7 in FIG. 3). Finally, in the display unit 500, the estimated position of the underwater object in question received from the analyzing unit 400 is displayed (step E1 in FIG. 2).

[0071]

(4) Next, the processing that the m-th transmission (step Bm in FIG. 2) is an even-numbered transmission will be described. In this case, in the m-th transmission (step Bm in FIG. 2), the waveform of S4 (a waveform transmitted in order of a high frequency wave and a low frequency wave) will be transmitted.

[0072]

In this case, in the processing of step Dm in FIG. 2, the analyzing unit 400 performs the processing from step F1 to step F4 in FIG. 3 similarly to the case of the above-mentioned (3). After that, in step F5 in FIG. 3, the analyzing unit 400 performs processing of (4-1) to be hereinafter described when the correlation processing with S3 has exceeded the threshold regarding the correlation processing result in step F1, or performs processing of (4-2) to be hereinafter described when the correlation processing with S4 has exceeded the threshold.

[0073]

(4-1) The processing thatcorrelation processing with S3 (a waveform transmitted in order of a low frequency wave and a high frequency wave) exceeds the threshold, as a result of the processing of the above-mentioned step F1, will be described below. In this case, the reflected wave is reflection in response to an odd-numbered transmission (step B[m-(2k-1)] (k=1, 2, 3, ...) in FIG. 2) before the m-th transmission (step Bm in FIG. 2). Therefore, the transmission wave determination section 440 determines to which transmission time of the odd-numbered transmission (step B[m-(2k-1)] (k=1, 2, 3, ...) in FIG. 2) before the m-th transmission (step Bm in FIG. 2) the estimated transmission time calculated in step F4 is proximate (step F5 in FIG. 3).

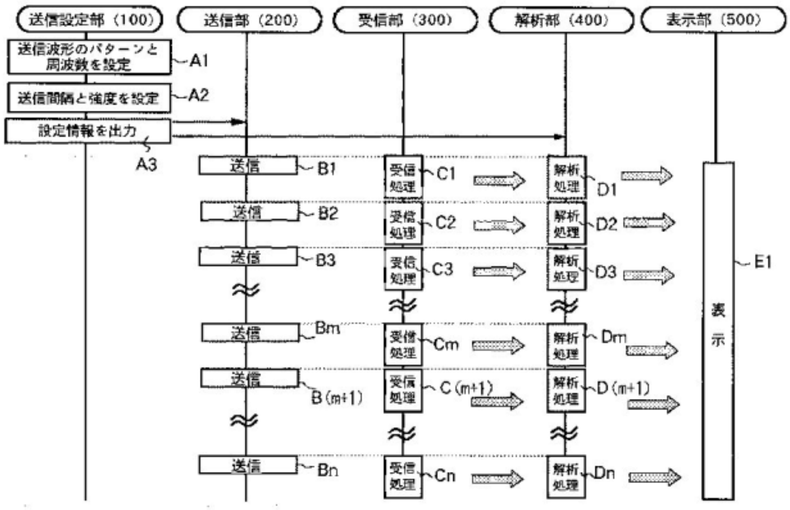
[0074]

(4-2) The processing that processing of correlation processing with S4 (a waveform transmitted in order of a high frequency wave and a low frequency wave) exceeds the threshold, as a result of the above-mentioned processing of step F1, will be described below. In this case, the reflected wave is reflection in response to the m-th transmission (step Bm in FIG. 2) or, an even-numbered transmission (step B[m-2k] (k=1, 2, 3, ...) in FIG. 2) before the m-th transmission. Therefore, the transmission wave determination section 440 determines to which transmission time of the m-th transmission (step Bm in FIG. 2) or the even-numbered transmission (step B[m-2k] (k=1, 2, 3, ...) in FIG. 2) before the m-th transmission the estimated transmission time calculated in step F4 is proximate (step F5 in FIG. 3).

[0075]

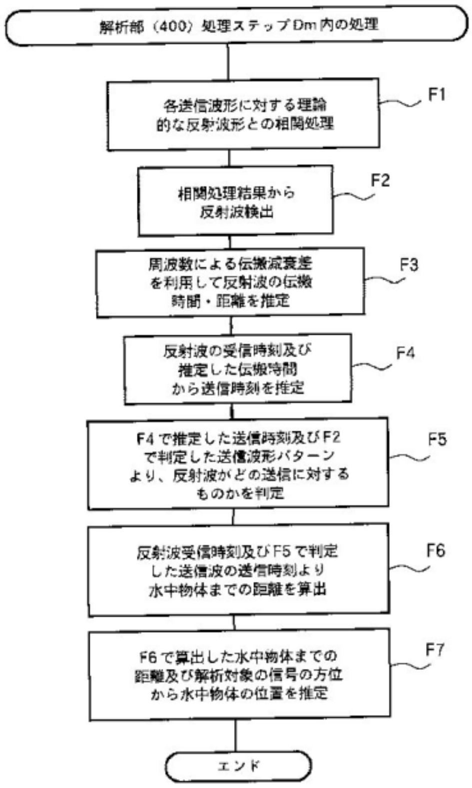
Hereinafter, the analyzing unit 400 in the present embodiment performs processing similar to the processing from step F6 to step F7 in the case of the above-mentioned (3). The present embodiment has an effect similar to that of the first embodiment."

[FIG. 2]



送信設定部　　　Transmission setting unit
送信波形のパターンと周波数を設定　　　Set pattern and frequency of transmission waveform
送信間隔と強度を設定　　Set intensity and interval of transmission
設定情報を出力　Output setting information
送信部　Transmission unit
送信　　Transmission
受信部　Receiving unit
受信処理　　　Reception processing
解析部　Analyzing unit
解析処理　　　Analysis processing
表示部　Display unit
表示　　Display

[FIG. 3]



解析部(400)処理ステップ Dm 内の処理

Processing in processing step Dm of analyzing unit (400)

各送信波形に対する理論的な反射波形との相関処理

Correlation processing with theoretical reflection waveform in response to each transmission waveform

相関処理結果から反射波検出

Reflected wave detection from correlation processing result

周波数による伝搬減衰差を利用して反射波の伝搬時間・距離を推定

Estimation of propagation time and distance of reflected wave using difference in propagation attenuation by frequencies

反射波の受信時刻及び推定した伝搬時間から送信時刻を推定

Estimation of transmission time from reception time of reflected wave and estimated propagation time

F4 で推定した送信時刻及び F2 で判定した送信波形パターンより、反射波がどの送信に対するものかを判定

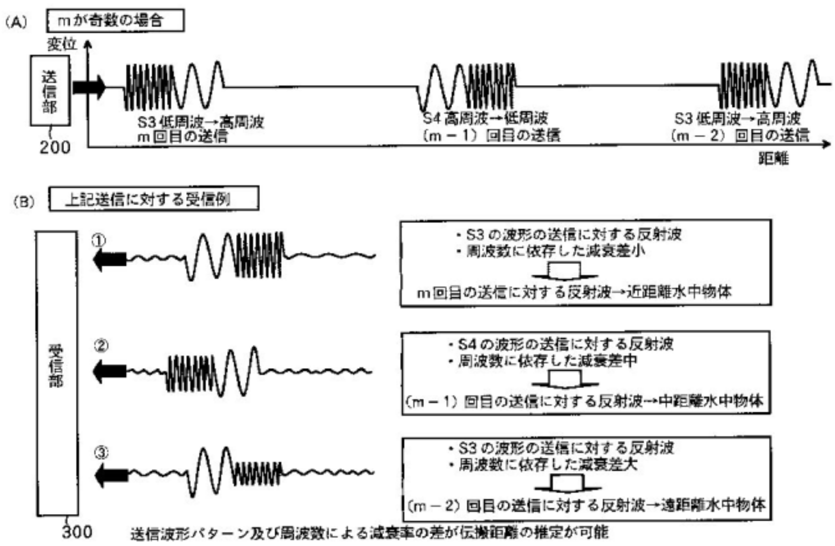
Determination regarding to which transmission the reflected wave corresponds, from transmission time estimated in F4 and transmission waveform pattern determined in F2

反射波受信時刻及び F5 で判定した送信波の送信時刻より水中物体までの距離を算出 Calculation of distance to underwater object from reception time of reflected wave and transmission time of transmission wave determined in F5

F6 で算出した水中物体までの距離及び解析対象の信号の方位から水中物体の位置を推定 Estimation of position of underwater object from distance to underwater object calculated in F6 and direction of signal of analysis target

エンド　End

[FIG. 5]



ｍが奇数の場合　When m is odd
変位　　Displacement
送信部　Transmission unit
S3 低周波→高周波ｍ回目の送信
　　　　S3 Low frequency --> high frequency m-th transmission
S4 高周波→低周波(ｍ-1)回目の送信
　　　　S4 High frequency --> low frequency (m-1)-th transmission
S3 低周波→高周波(ｍ-2)回目の送信
　　　　S3 Low frequency --> high frequency (m-2)-th transmission
距離　　Distance
上記送信に対する受信例
　　　　Examples of reception in response to the above transmission
受信部　Receiving unit
・S3 の波形の送信に対する反射波
　　　　*Reflected wave in response to transmission of waveform S3
・周波数に依存した減衰差小
　　　　*Attenuation difference by frequencies is small
・ｍ回目の送信に対する反射波→近距離水中物体
　　　　*Reflected wave in response to m-th transmission --> short-distance underwater object
・S4 の波形の送信に対する反射波
　　　　*Reflected wave in response to transmission of waveform S4
・周波数に依存した減衰差中
　　　　*Attenuation difference by frequencies is medium
・(ｍ-1)回目の送信に対する反射波→中距離水中物体
　　　　Reflected wave in response to (m-1)-th transmission --> medium-distance underwater object

・周波数に依存した減衰差大

*Attenuation difference by frequencies is large

・(ｍ-2)回目の送信に対する反射波→遠距離水中物体

*Reflected wave in response to (m-2)-th transmission --> long-distance underwater object

送信波形パターン及び周波数による減衰率の差が伝搬距離の推定が可能

Difference in attenuation rate due to transmission waveform pattern and frequencies enables estimation of propagation distance

C　In Cited Document 1, there is described an invention of a sound-wave propagation distance estimation method that enables performance of long-distance search of an underwater object efficiently while performing short-distance search at the same time ([0001]).

Also, in Cited Document 1, it is described that sound waves are repeatedly transmitted at constant time intervals and a reflected wave from an underwater object is searched by analyzing received sound waves ,according to that active sonar is common as a method for searching an underwater object ([0002]).　Therefore, the invention of a sound-wave propagation distance estimation method described in Cited Document 1 is one that searches an underwater object by a method according to active sonar in which sound waves are repeatedly transmitted at constant time intervals, and received sound waves are analyzed to search a reflected wave from an underwater object.

D　Based on the above C, when the statements of the above B of Cited Document 1 are summarized, there is described the following invention (hereinafter, referred to as "Cited Invention") in Cited Document 1.

"A sound-wave propagation distance estimation method that is a method according to active sonar in which sound waves are repeatedly transmitted at constant time intervals, and received sound waves are analyzed to search a reflected wave from an underwater object, the method enabling performance of long-distance search of an underwater object efficiently while performing short-distance search at the same time, the method comprising:

transmitting in a manner combining a low frequency wave and a high-frequency wave in turn and switching their order so as to transmit S3 (a waveform transmitted in order of a low frequency wave and a high frequency wave) in odd-numbered transmissions or S4 (a waveform transmitted in order of a high frequency wave and a low frequency wave) in even-numbered transmissions one after the other; and

when the m-th transmission is an odd-numbered transmission; that is, S3 (a waveform transmitted in order of a low frequency wave and a high frequency wave):

performing correlation processing between an analyzing signal for each direction and a theoretical reflection waveform in response to each of the transmission waveforms of S3 (a waveform transmitted in order of a low frequency wave and a high frequency wave) and S4 (a waveform transmitted in order of a high frequency wave and a low frequency wave) (step F1);

extracting a reflected wave from an underwater object as a signal of a portion for which, as a result of the processing of the step F1, correlation with a theoretical reflection waveform in response to transmission waveform of S3 (a waveform transmitted in order of a low frequency wave and a high frequency wave) or S4 (a waveform transmitted in order of a high frequency wave and a low frequency wave) exceeds a threshold (step F2);

calculating a rough propagation time and propagation distance from an intensity ratio between the high frequency component and the low frequency component of the reflected wave extracted in step F2 (step F3);

calculating an estimated transmission time from the propagation time calculated in step F3 (step F4);

determining the estimated transmission time calculated in step F4 is proximate, since the received reflected wave is a reflected wave in response to the m-th transmission or an even-numbered transmission before the m-th transmission, to which transmission time of the m-th transmission and transmission time of an even-numbered transmission before the m-th transmission, whencorrelation processing with S3 (a waveform transmitted in order of a low frequency wave and a high frequency wave) exceeds the threshold, as a result of the processing of the above-mentioned step F1 (step F5); and

determining the estimated transmission time calculated in step F4 is proximate, since the received reflected wave is a reflected wave in response to odd-numbered transmission before the m-th transmission, to which transmission time of an odd-numbered transmission before the m-th transmission whenprocessing of correlation processing with S4 (a waveform transmitted in order of a high frequency wave and a low frequency wave) exceeds the threshold, as a result of the above-mentioned processing of step F1,, (step F5); and

calculating the distance to an underwater object forming the reflected wave from the transmission time of the transmission and the reception time of the reflected wave, by the determination in the above step F5, it can be determined that the reflected wave in question is a reflected wave in response to which transmission, (step F6),

when the m-th transmission is an even-numbered transmission; that is, the waveform of S4 (a waveform transmitted in order of a high frequency wave and a low frequency wave) is transmitted:

after performing the processing from step F1 to step F4, in a similar fashion,

determining the estimated transmission time calculated in step F4 is proximate since the reflected wave is reflection in response to an odd-numbered transmission before the m-th transmission, to which transmission time of an odd-numbered transmission before the m-th transmission when processing of correlation processing with S3 (a waveform transmitted in order of a low frequency wave and a high frequency wave) exceeds the threshold, as a result of the above-mentioned processing of step F1, (step F5);

determining the estimated transmission time calculated in step F4 is proximate, since the received reflected wave is a reflected wave in response to the m-th transmission or an even-numbered transmission before the m-th transmission, to which transmission time of the m-th transmission and transmission time of an even-numbered transmission before the m-th transmissionwhenprocessing of correlation processing with S4 (a waveform transmitted in order of a high frequency wave and a low frequency wave) exceeds the threshold, as a result of the above-mentioned processing of step F1 (step F5); and hereinafter, performing the processing of step F6."

以下の（２）対比と（３）一致点および相違点の章において、"・・・"の部分は、補正発明（the Amended Invention）と引用発明（Cited Invention）の部分をそのまま記載する部分ですので、上で修正しました補正発明（the Amended Invention）と引用発明（the Amended Invention）の記載に合わせてください。

(2) Comparison

Comparison between the Amended Invention and Cited Invention is as follows.

A Since the "sound-wave propagation distance estimation method" of Cited Invention "enables performance of long-distance search of an underwater object efficiently while performing short-distance search at the same time", it corresponds to the "probe method" of the Amended Invention.

Also, it is recognized that "a method according to active sonar in which sound waves are repeatedly transmitted at constant time intervals, and received sound waves are analyzed to search a reflected wave from an underwater object" of Cited Invention is a method that is implemented in an active sonar device.

Therefore, the "sound-wave propagation distance estimation method that is a method according to active sonar in which sound waves are repeatedly transmitted at constant time intervals, and received sound waves are analyzed to search a reflected wave from an underwater object, the method enabling performance of long-distance search of an underwater object efficiently while performing short-distance search at the same time" of Cited Invention corresponds to the "probe method in a sonar device" of the Amended Invention.

B Cited Invention is an invention of "sound-wave propagation distance estimation method that is a method according to active sonar in which sound waves are repeatedly transmitted at constant time intervals, and received sound waves are analyzed to search a reflected wave from an underwater object, the method enabling performance of search of an underwater object", and, therefore, it is obvious that "low frequency wave" and "high-frequency wave" of Cited Invention are sound waves together and they have different frequencies from each other. Then, it is recognized that the frequency of a sound wave is a characteristic that enables to distinguish the sound wave from other sound waves, and therefore "low frequency wave" and "high frequency wave" of the Cited Invention are sound waves that have different characteristics from each other.

Accordingly, "low frequency wave" and "high frequency wave" of Cited Invention correspond to "a plurality of sound waves having different characteristics" of the Amended Invention.

C Since "S3 (a waveform transmitted in order of a low frequency wave and a high frequency wave)" and "S4 (a waveform transmitted in order of a high frequency wave and a low frequency wave)" of Cited Invention are ones that are "transmitted one after the other", they correspond to "probe waves that are transmission pulses" of the Amended Invention.

D Since "S3 (a waveform transmitted in order of a low frequency wave and a high frequency wave)" and "S4 (a waveform transmitted in order of a high frequency wave and a low frequency wave)" of Cited Invention are made up "in a manner combining a low frequency wave and a high-frequency wave in turn and switching their order", these correspond to "probe waves that are transmission pulses" "generated" "by combining a plurality of sound waves having different characteristics" of the Amended Invention, in light of the above B and C.

E Since it is possible to distinguish between "S3 (a waveform transmitted in order of a low frequency wave and a high frequency wave)" and "S4 (a waveform transmitted in order of a high frequency wave and a low frequency wave)" of Cited Invention from each other, these correspond to "different kinds of the probe waves" of the Amended Invention in light of the above B to D.

F As the above B to E are summarized, "transmitting in a manner combining a low frequency wave and a high-frequency wave in turn and switching their order so as to transmit S3 (a waveform transmitted in order of a low frequency wave and a high frequency wave) in an odd-numbered transmission or S4 (a waveform transmitted in order of a high frequency wave and a low frequency wave) in an even-numbered transmission one after the other" of Cited Invention corresponds to " generating different kinds of the probe waves that are transmission pulses by combining a plurality of sound waves having different characteristics " and "transmittingin series" of the Amended Invention.

G Cited Invention performs the processing of "step F1" and "step F2" "when the m-th transmission is an odd-numbered transmission; that is, S3 (a waveform transmitted in order of a low frequency wave and a high frequency wave) is transmitted", and "when the m-th transmission is an even-numbered transmission; that is, the waveform of S4 (a waveform transmitted in order of a high frequency wave and a low frequency wave) is transmitted", "performs the processing from step F1 to step F4, in a similar fashion", and, therefore, in both the case of "when the m-th transmission is an odd-numbered transmission" and the case of "being an even-numbered transmission", performs the processing of "step F1" and "step F2". In other words, Cited Invention is an invention which "extracts a reflected wave from an underwater object" every time when "transmitting in a manner combining a low frequency wave and a high-frequency wave in turn and switching their order so as to transmit S3 (a waveform transmitted in order of a low frequency wave and a high frequency wave) in an odd-numbered transmission or S4 (a waveform transmitted in order of a high frequency wave and a low frequency wave) in an even-numbered transmission one after the other" (step F2).

Therefore, in light of the above F, performing the processing of "step F1" and "step F2" of Cited Invention corresponds to "receiving reflected waves of the probe waves" of the Amended Invention.

H Cited Invention performs the processing of "step F3" and "step F4" "when the m-th transmission is an odd-numbered transmission; that is, S3 (a waveform transmitted in order of a low frequency wave and a high frequency wave) is transmitted,", and "when m-th transmission is an even-numbered transmission; that is, the waveform of S4 (a waveform transmitted in order of a high frequency wave and a low frequency wave) is transmitted," "performs the processing from step F1 to step F4, in a similar fashion", and, therefore, in both the cases of "when the m-th transmission is an odd-numbered transmission" and "when the m-th transmission is an even-numbered transmission", performs the processing of "step F3" and "step F4". Then, after that, in both the cases of "when the m-th transmission is an odd-numbered transmission" and "when the m-th transmission is an even-numbered transmission", Cited Invention performs the processing of "step F5" and "step F6". In other words, Cited Invention is one that applies, every time "extracting a reflected wave from an underwater object" (step F2), a series of processing to "the reflected wave extracted in step F2" (step F3) to "calculate the distance to an underwater object forming the reflected wave" (step F6).

Therefore, in light of the above G, performing the processing of "step F3" to "step F6" of Cited Invention correspond to "processing the received reflected waves" of the Amended Invention.

(3) Corresponding features and different features

When the results of comparison of the above (2) are summarized, the corresponding features and the different features between the Amended Invention and Cited Invention are as follows.

A Corresponding features

"A probe method in a sonar device, comprising:

generating different kinds of the probe waves that are transmission pulses by combining a plurality of sound waves having different characteristics,and transmitting those waves in series;

receiving reflected waves of the probe waves; and

processing the reflected waves."

B Different Feature 1

In the Amended Invention, when "generating different kinds of the probe waves that are transmission pulses by combining a plurality of sound waves having different characteristics,and transmitting those waves in series ", transmission is performed "at a sampling rate depending on a number of the different kinds", whereas,

Cited Invention remains at a point of "transmitting in a manner combining a low frequency wave and a high-frequency wave in turn and switching their order so as to transmit S3 (a waveform transmitted in order of a low frequency wave and a high frequency wave) in odd-numbered transmissions or S4 (a waveform transmitted in order of a high frequency wave and a low frequency wave) in even-numbered transmissions one after the other" (this corresponds to "by generating probe waves that are transmission pulses by combining a plurality of sound waves having different characteristics, generating different kinds of the probe waves to transmit the probe waves in series" of the Amended Invention).

(4) Judgment regarding Different Feature 1

A According to the statements of the above (1)B of Cited Document 1, the following matters are recognized regarding Cited Invention.

(A) As searching an underwater object existing at a long distance, using a method according to active sonar in which sound waves are repeatedly transmitted at constant time intervals and received sound waves are analyzed to search a reflected wave from an underwater object, it is necessary to secure transmission time intervals sufficiently long in order to take into consideration a time period during which a sound wave propagates far, hits an underwater object to be reflected, and returns to its transmission point. On the other hand, as searching an underwater object existing at a short distance, sound waves need to be transmitted in short time intervals ([0002] to [0004]).

(B) However, at the time when there exists a very large underwater object at a long distance, if sound waves are transmitted at short time intervals in order to search an underwater object at a short distance, there is a case where a sound wave transmitted in the past propagates far and hits an underwater object at a long distance, and a reflected wave in response to that is received with sufficient intensity capable of being detected even at its transmission point. In such a case, a reflected wave from an underwater object at a short distance in response to a sound wave that has been transmitted immediately before and a reflected wave from an underwater object at a long distance in response to a sound wave that has been transmitted in the past and has propagated far cannot be discriminated, and thus there has been a problem to be solved that a position of an underwater object at a long distance cannot be obtained during search of an underwater object at a short distance ([0006] and [0007]).

(C) Cited Invention is an invention that has solved this problem by transmitting into water a plurality of sound waves made by combining sound waves composed of a plurality of frequency bands different from each other in an order that is different from each other in a manner switching at a set time interval cyclically ([0013]), and it is possible to obtain a position of an underwater object also from a reflected wave in response to a sound wave transmitted in the past. Therefore, it is possible to perform search at a short distance and a long distance at the same time by making a transmission interval short, resulting in exerting an effect that short-distance search and long-distance search can be achieved at the same time efficiently ([0029]).

B When the above matters are summarized, Cited Invention is an invention that has solved the problem that, if sound waves are transmitted at short time intervals in order to search an underwater object at a short distance, a sufficiently long transmission time interval necessary for searching an underwater object at a long distance cannot be secured, by transmitting into water a plurality of sound waves made by combining sound waves composed of a plurality of frequency bands different from each other in an order that is different from each other in a manner switching at a set time interval cyclically; that is, by "transmitting in a manner combining a low frequency wave and a high-frequency wave in turn and switching their order so as to transmit S3 (a waveform transmitted in order of a low frequency wave and a high frequency wave) in odd-numbered transmissions or S4 (a waveform transmitted in order of a high frequency wave and a low frequency wave) in even-numbered transmissions one after the other". By this, even when transmitting sound waves at transmission time intervals that have not been able to be used in search of an underwater object at a long distance conventionally (that is, short time intervals for searching an underwater object at a short distance), search of an underwater object at a long distance has become possible.

In other words, in Cited Invention, a short transmission time interval that is an interval for searching an underwater object existing at a short distance conventionally is used as a transmission time interval for searching an underwater object at a long distance.

This is none other than making a transmission time interval for searching an underwater object at a long distance short in response to "transmitting in a manner combining a low frequency wave and a high-frequency wave in turn and switching their order so as to transmit S3 (a waveform transmitted in order of a low frequency wave and a high frequency wave) in odd-numbered transmissions or S4 (a waveform transmitted in order of a high frequency wave and a low frequency wave) in even-numbered transmissions one after the other"; that is, making a sampling rate be increased in response to making a transmission waveform be of two types of "S3 (a waveform transmitted in order of a low frequency wave and a high frequency wave)" and "S4 (a waveform transmitted in order of a high frequency wave and a low frequency wave)".

From this, also in Cited Invention, on the occasion of "transmitting in a manner combining a low frequency wave and a high-frequency wave in turn and switching their order so as to transmit S3 (a waveform transmitted in order of a low frequency wave and a high frequency wave) in odd-numbered transmissions or S4 (a waveform transmitted in order of a high frequency wave and a low frequency wave) in even-numbered transmissions one after the other" (this corresponds to "by generating probe waves that are transmission pulses by combining a plurality of sound waves having different characteristics, generating different kinds of the probe waves to transmit the probe waves in series" of the Amended Invention), transmission will be performed "at a sampling rate depending on a number of the different kinds".

Therefore, Different Feature 1 is not a substantive difference, and thus there is no different feature between the Amended Invention and Cited Invention.

(5) Appellant's allegation

The Appellant alleges that the invention described in Cited Document 1 is for the purpose of efficiently performing long-distance search while performing short-distance search at the same time, and, in addition, in Cited Document 1, there is no viewpoint of improving a sampling rate for enabling to obtain object information.

However, as previously mentioned, in Cited Invention, a short transmission time interval that is an interval for searching an underwater object existing at a short distance conventionally is used as a transmission time interval for searching an underwater object at a long distance. Then, conventionally, a position of an underwater object at a long distance cannot be obtained when transmitting sound waves at short transmission time intervals in order to search an underwater object at a short distance. However, in Cited Invention, a position of an underwater object at a long distance can be obtained even if sound waves are transmitted at such short transmission time intervals, and, therefore, it is obvious that a sampling rate for enabling to obtain object information has been improved.

Therefore, the Appellant's allegation cannot be adopted.

(6) Summary of judgment regarding the independent requirements for patentability

The Amended Invention is an invention described in Cited Document 1 (Cited Invention), and falls under Article 29(1)(iii) of the Patent Act. Therefore, the appellant should not be granted a patent for that independently at the time of patent application.

4 Closing of decision to dismiss the amendment

As described above, the Amendment violates the provisions of Article 126(7) of the Patent Act as applied mutatis mutandis pursuant to the provisions of Article 17-2(6) of the same Act.

Therefore, the Amendment should be dismissed under the provisions of Article 53(1) of the same Act which is applied mutatis mutandis pursuant to the provisions of Article 159(1) of the same Act.

Accordingly, in conclusion, the above-mentioned decision to dismiss the amendment has been made.

No. 3 Judgment regarding the invention according to the Present Application

1 Invention according to the Present Application

Since the Amendment has been dismissed as in No. 2 above, the inventions according to claim 1 to claim 10 of the Present Application are ones specified by the matters described in claim 1 to claim 10 of the scope of the claims of the Present Application before the Amendment.

In particular, the invention according to claim 10 of the Present Application (hereinafter, referred to as "the Invention") is as shown in the above 1(1) of No. 2.

2 Outline of the examiner's decision

The Invention is an invention described in Cited Document 1, and thus falls under Article 29(1)(iii) of the Patent Act. Therefore, the appellant should not be granted a patent for that.

3 Invention described in Cited Document 1

The invention described in Cited Document 1 (Cited Invention), is as shown in 3(1)D of No. 2.

4 Comparison / judgment

The Invention is an invention made by eliminating, from the Amended Invention, the limitation to the effect that "probe method" is a method "in a sonar device" and eliminating the limitation to the effect that "sampling rate" on the occasion of "generating different kinds of the probe waves and transmitting those waves in series" is a "sampling rate depending on a number of the different kinds".

Then, the Amended Invention that includes all the matters specifying the invention of the Invention and adds the above limitations is an invention described in Cited Document 1, as shown in No. 2 and No. 3.

Therefore, in a similar way, the Invention is also an invention described in Cited Document 1.

5 Closing

Since the Invention is an invention described in Cited Document 1, it falls under Article 29(1)(iii) of the Patent Act, and thus the Appellant should not be granted a patent for that.

Accordingly, without examining the inventions according to the other claims, the Present Application should be rejected.

Therefore, the appeal decision shall be made as described in the conclusion.

Sep. 19, 2018

Chief administrative judge: SHIMIZU, Minoru
Administrative judge: KOBAYASHI, Norifumi
Administrative judge: NAKAMURA, Setsushi