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**D E C I S I O N**  
**of 30 June 2005**

**Case Number:** T 0458/04 - 3.2.1  
**Application Number:** 91910983.5  
**Publication Number:** 0535044  
**IPC:** B63G 7/00, B63G 8/00  
**Language of the proceedings:** EN

**Title of invention:**  
Method and device for tracing an object

**Patentee:**  
Kongsberg Defence & Aerospace AS, et al

**Opponent:**  
Atlas Elektronik GmbH  
BAE SYSTEMS Electronics Limited

**Headword:**  
-

**Relevant legal provisions:**  
EPC Art. 56, 83, 123(2)

**Keyword:**  
"Amendments - added subject-matter (yes) - main request"  
"Disclosure - sufficiency (yes)"  
"Inventive step (yes)"

**Decisions cited:**  
-

**Catchword:**  
-



Case Number: T 0458/04 - 3.2.1

**D E C I S I O N**  
of the Technical Board of Appeal 3.2.1  
of 30 June 2005

**Appellant:** Atlas Elektronik GmbH  
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**Decision under appeal:**

Interlocutory decision of the Opposition  
Division of the European Patent Office posted  
24 February 2004 concerning maintenance of  
European patent No. 0535044 in amended form.

**Composition of the Board:**

**Chairman:** S. Crane  
**Members:** J. Osborne  
A. Pignatelli

## Summary of Facts and Submissions

- I. The appeal of opponent I is directed against the decision posted 24 February 2004 according to which it was found that, account being taken of the amendments made by the patent proprietor during the opposition proceedings, European patent No. 0 535 044 and the invention to which it relates were found to meet the requirements of the EPC.
- II. The following prior art played an important role during the appeal proceedings:
- A5: M. Hewish, "Remotely operated vehicles for naval mine warfare", International Defense Review, April 1989, 441 - 45
- B5: "Mine detection and neutralisation devices", Military Technology MILTECH, (I) February 1984, 64 - 70, (II) May 1984, 92 - 103
- D1: H-R. Buschhorn et al, "Minenjagd - eine moderne Variante der Seeminenabwehr", Jahrbuch der Wehrtechnik, 10, 1976/77, 142 - 51
- III. During oral proceedings held 30 June 2005 the appellant requested that the decision under appeal be set aside and that the patent be revoked. The respondent requested that the appeal be dismissed (main request) or in the alternative that the patent be maintained in further amended form on the basis of claims 1 to 12 filed during the oral proceedings (auxiliary request).

IV. A party as of right (opponent II) took no part in the appeal procedure.

V. The independent claims 1 and 8 according to the respondent's main request read as follows:

"1. A method for tracking and neutralizing a subsea object (2a), in particular a seamine, comprising the steps of

transmission of searching rays (3n) into a subsea covering area from at least one sonar (3a) on a mother vessel (1) or an intermediate craft (101), displaying echo signals from one or more sub-sea objects (2a) in a searching field corresponding to said covering area on a display (16a) on the mother vessel (1),

launching from said mother vessel (1) or the intermediate craft (101) a searching and neutralizing unit (2), which for remote operation is connected by communication means with the mother vessel (1) or the intermediate craft (101) and is provided with a charge for mine destruction, and guiding said unit into said covering area,

said searching and neutralizing unit (2) comprising at least one transponder/responder (13) responding to the searching rays (3n) transmitted by the sonar (3a) by transmission of response signals tuned to the searching rays (3n),

registering said response signals on the display (16a) on the mother vessel (1),

utilizing said registered response signals for remote control of the searching and neutralizing unit (2) along the searching rays (3n) of the sonar towards said object (2a), and

detonating said charge by an operator on the mother vessel,

characterized by the additional steps of

transmission of an additional acoustic signal from the transponder/responder, receiving said additional signal by a plurality of hydrophones on the sonar and measuring the signal phase or time delay of signals from said plurality of hydrophones for determination of the position of the searching and neutralizing unit (2) in the horizontal plane and/or the vertical plane for guiding the searching and neutralizing unit (2) from said launching into said covering area,

controlling the transmission of signals from the transponder/responder to include a selective code and with a control in time causing said transmitted signals to be received by the sonar within a time interval set by the sonar for receiving said echo signals and to be displayed on said display to be distinguishable from said echo signals, and

utilizing as said searching and neutralizing unit a non-returnable weapon.

8. A device for tracking and neutralizing a subsea object, in particular a sea-mine, said device being

adapted to a mother vessel (1) or an intermediate craft (101) equipped with at least one sonar (3a) for transmission of searching rays (3n) into a subsea covering area and a display (16a) for displaying echo signals from one or more objects in a subsea searching field corresponding to said covering area, and said device comprising

a searching and neutralizing unit (2), which can be launched from said mother vessel (1) or intermediate craft (101), said unit being connected with the mother vessel (1) or intermediate craft (101) by communication means for remote operation and being provided with a charge for mine destruction,

said searching and neutralizing unit (2) comprising at least one transponder/responder (13) responding to the searching rays (3n) transmitted by the sonar (3a) by transmission of a response signal tuned to the searching rays (3n),

means for registering said response signal on the display (16a), processing indications on the display (16a) in relation to said object (2) and utilizing said processing for remote control of the searching and neutralizing unit (2) along the searching rays (3n) of the sonar towards said object (2a),

characterized in that the transponder/responder (13) comprises

means for transmission of an additional acoustic signal, the sonar being provided with a plurality of hydrophones (15) for receiving said additional acoustic

signal and means for measuring the signal phase or time delay of signals from said plurality of hydrophones for determination of the position of the searching and neutralizing unite (*sic*) (2) in the horizontal plane and/or the vertical plane for guiding the searching and neutralizing unit (2) from said launching into said covering area, and

means for controlling the transmission of signals from the transponder/responder to include a selective code and with a control in time causing said transmitted signals to be received by the sonar within a time interval set by the sonar for receiving said echo signals and to be displayed on said display to be distinguishable from said echo signals, and

that the searching and neutralizing unit is a non-returnable weapon."

VI. The independent claims 1 and 7 according to the respondent's auxiliary request read as follows, wherein text added in comparison with the corresponding claims of the main request is shown in bold and text deleted is shown in [-]:

"1. A method for tracking and neutralizing a subsea object (2a), in particular a seamine, comprising the steps of  
transmission of searching rays (3n) into a subsea covering area from at least one sonar **having a transducer** (3a) on a mother vessel (1) or an intermediate craft (101),



displaying echo signals from one or more sub-sea objects (2a) in a searching field corresponding to said covering area on a display (16a) on the mother vessel (1),

launching from said mother vessel (1) or the intermediate craft (101) a searching and neutralizing unit (2), which for remote operation is connected by communication means with the mother vessel (1) or the intermediate craft (101) and is provided with a charge for mine destruction, and guiding said unit into said covering area,

said searching and neutralizing unit (2) comprising at least one transponder/responder (13) responding to the searching rays (3n) transmitted by the sonar (3a) by transmission of response signals tuned to the searching rays (3n),

registering said response signals on the display (16a) on the mother vessel (1),

utilizing said registered response signals for remote control of the searching and neutralizing unit (2) along the searching rays (3n) of the sonar towards said object (2a), and

detonating said charge by an operator on the mother vessel,

characterized by the additional steps of

transmission of an additional acoustic signal from the transponder/responder, receiving said additional signal

by a plurality of hydrophones on **the transducer (3a)** of the sonar and measuring the signal phase or time delay of signals from said plurality of hydrophones for determination of the position of the searching and neutralizing unit (2) in the horizontal plane and/or the vertical plane for guiding the searching and neutralizing unit (2) from said launching into said covering area,

controlling the transmission of signals from the transponder/responder to include a selective code and with a control in time causing said transmitted signals to be received by the sonar within a time interval set by the sonar for receiving said echo signals and to be displayed on said display to be distinguishable from said echo signals, and

utilizing as said searching and neutralizing unit a non-returnable weapon.

7. A device for tracking and neutralizing a subsea object, in particular a sea-mine, said device being adapted to a mother vessel (1) or an intermediate craft (101) equipped with at least one sonar **having a transducer (3a)** for transmission of searching rays (3n) into a subsea covering area and a display (16a) for displaying echo signals from one or more objects in a subsea searching field corresponding to said covering area, and said device comprising

a searching and neutralizing unit (2), which can be launched from said mother vessel (1) or intermediate craft (101), said unit being connected with the mother vessel (1) or intermediate craft (101) by communication

means for remote operation and being provided with a charge for mine destruction,

said searching and neutralizing unit (2) comprising at least one transponder/responder (13) responding to the searching rays (3n) transmitted by the sonar (3a) by transmission of a response signal tuned to the searching rays (3n),

means for registering said response signal on the display (16a), processing indications on the display (16a) in relation to said object (2) and utilizing said processing for remote control of the searching and neutralizing unit (2) along the searching rays (3n) of the sonar towards said object (2a),

characterized in that

the transponder/responder (13) comprises means for transmission of an additional acoustic signal, **the transducer of** the sonar [being provided with] **having located thereon** a plurality of hydrophones (15) for receiving said additional acoustic signal [and] **the sonar having** means for measuring the signal phase or time delay of signals from said plurality of hydrophones for determination of the position of the searching and neutralizing unit (*sic*) (2) in the horizontal plane and/or the vertical plane for guiding the searching and neutralizing unit (2) from said launching into said covering area, and means for controlling the transmission of signals from the transponder/responder to include a selective code and with a control in time causing said transmitted signals to be received by the sonar within a time interval set

by the sonar for receiving said echo signals and to be displayed on said display to be distinguishable from said echo signals, and

that the searching and neutralizing unit is a non-returnable weapon."

Claims 2 to 6 and 8 to 12 contain features additional to those of claims 1 and 7 respectively.

VII. The appellant's arguments may be summarised as follows:

In the application as originally filed the only disclosure of the hydrophones being located on the sonar was that they were located on its transducer. In claims 1 and 8 according to the main request, however, they are stated to be located merely on the sonar. The sonar in this context is not necessarily the transducer and the subject-matter of claims 1 and 8 according to the main request therefore extends beyond the content of the application as originally filed.

There is insufficient disclosure in the patent specification of the feature of control in time of the transmission of the response signals from the transponder/responder and the use of the registered signal on the display for remote control of the searching and neutralising unit towards the sub-sea object. As a result of the control in time the relative positions of the searching and neutralising unit and the sub-sea object on the sonar display would not change, rendering it impossible to use the display to steer the searching and neutralising unit towards the sub-sea object. When the searching and neutralising

unit is sufficiently close to the sub-sea object the control in time would be set to a zero delay, as in the prior art. Although from that time it would be possible to steer the searching and neutralising unit towards the sub-sea object it is not disclosed how it is determined that that time has been reached.

The closest prior art is known from D1, corresponding to the features of the respective preambles of the independent claims. The problem which the Opposition Division determined as being the one to be solved, a reduction in time to destruction of the object, is already addressed in both D1 and B5. The characterising features are juxtaposed and only the feature relating to the non-returnable weapon contributes to a reduction in time to destruction of the object. Both of the documents A5 and B5 disclose the features relating to the use of hydrophones. Moreover, it is the normal procedure to set the area covered by the sonar window in accordance with the level of interference. If the resulting area is too small to include both the searching and neutralising unit and the sub-sea object the skilled person has only two possibilities, either to increase the size of the area or to control the transmission of the signals in order that they may be shown together on the display. As evidenced by B5 coding of the signals in order to distinguish them on the display is also known. Finally, B5 carries the suggestion that the searching and neutralising unit may be expendable. It follows that the subject-matter of the independent claims does not involve an inventive step.

VIII. The respondent's counter-arguments may be summarised as follows:

A literal basis for the feature of claims 1 and 8 according to the main request that the hydrophones are mounted "on the sonar" is given in the original application page 7, lines 32 to 37. Nevertheless, the skilled person would be aware when reading the application as originally filed that the mounting of the hydrophones on the sonar would be of no technical significance and that the only important requirement as regards their mounting is that they are capable of performing their function. Their mounting elsewhere, for example on the support of the transducer, would satisfy this requirement. The subject-matter of claims 1 and 8 according to the main request therefore does not extend beyond the content of the application as filed.

When the searching and neutralising unit is launched it is tracked by the hydrophones receiving the additional acoustic signals. As a result, at the time that the searching and neutralising unit enters the sonar beam its position is known and by appropriately delaying the transmission of the signal from the transponder/responder it may be shown on the sonar display together with the signal received from the sub-sea object. Subsequent signals are delayed by an amount of time reduced according to the distance travelled by the searching and neutralising unit in the intervening time. It follows that even if the signal on the sonar screen representing the searching and neutralising unit is stationary this results from a known distance travelled, permitting the unit to be steered to the

object. It follows that the skilled person presented with the patent specification would be capable of putting the invention into effect.

As regards inventive step, B5 discloses only the idea of not recovering expensive searching and neutralising units in an emergency or at best merely the idea of making an expendable unit without any information as to how this might be achieved. The expendable searching and neutralising unit is the core of the present invention and all other characterising features relate to constraints imposed by its expendability. As a result of its expendability the unit would be smaller and lighter than is conventional, leading to a poorer signal on the sonar. Moreover, in comparison with a prior art unit which typically carries its own gyro-compass, the expendable unit would be more difficult to navigate when not able to be tracked using the sonar. The tracking system using hydrophones permits navigation prior to the entry of the searching and neutralising unit into the beam of the sonar. The coded response signal is advantageous in the case of the expendable unit because of the poorer signal. The time control feature permits the use of a small sonar covering area, thereby achieving acceptable definition on the screen despite the poorer signal.

## Reasons for the Decision

### *Main request*

#### *Addition of subject-matter (Article 100(c) EPC)*

1. Claim 1 states that the plurality of hydrophones are "on the sonar" whilst claim 8 has the feature of "the sonar being provided with a plurality of hydrophones".
  - 1.1 At first sight a literal basis may appear to exist for the above-mentioned features in the application as originally filed because page 7, lines 32 to 34 contains the wording "the four hydrophones ... mounted on the classification sonar 3a". However, this wording is not the first mention of the hydrophones. Page 7, lines 11 to 17 states that "the hydrophones 15 in this system can be located on the transducer of the mine hunting sonar 3a, as illustrated in Figure 3. Said hydrophones could possibly be located on the mother vessel itself and/or on an intermediate craft, for example an ROV." Page 7, lines 32 to 34 therefore is not an independent disclosure of the location of the hydrophones but a continuation of the description which refers also to Figures 3A and 3B which in turn are described on page 6, lines 23 to 25 as illustrating "the hydrophone location on the transducer". In Figure 3A, the hydrophones are shown located at the four corners of the transducer. It follows that the wording on page 7, lines 32 to 34 is merely an abbreviated reference to the previously described location of the hydrophones on the transducer of the sonar. The feature of the hydrophones is also contained in claims 4 and 11 as originally filed. However, in



both claims the only disclosed location on the sonar is on the transducer.

1.2 It follows from the foregoing that the only explicit disclosure in the application as originally filed of the location of the hydrophones on the sonar is on the transducer. Nevertheless, the respondent argues that the skilled person would appreciate that other locations on the sonar would be suitable for mounting the hydrophones and cites the transducer support as an example. However, present claim 1 requires "measuring the signal phase or time delay of said signals from said plurality of hydrophones" whilst claim 8 specifies "means for measuring the signal phase or time delay of signals from said plurality of hydrophones". From this it is implicit that the hydrophones must be spaced apart in order that a phase shift or time delay exists between the signal as received by the various hydrophones. In Figure 1A of the application as filed the sonar transducer is illustrated as being supported on a single mast in order to allow rotation of the transducer. Such a mast would not provide the spacing between the hydrophones which would be necessary to establish the phase shift or time delay specified in present claims 1 and 8.

1.3 The Board concludes on the basis of the foregoing that the skilled person would understand from the application as originally filed that if the hydrophones are to be mounted on the sonar, it is necessary that they be mounted on its transducer. Since present claims 1 and 8 provide the information that this need not be the case it follows that the skilled person has been presented with information which was not derivable

from the application as originally filed, the opposition ground according to Article 100(c) EPC is valid and the main request must be refused.

*Auxiliary request*

*Addition of subject-matter (Article 100(c) EPC)*

2. Claim 1 and claim 7, which corresponds to claim 8 according to the main request, now contain the feature that the hydrophones are located on the transducer of the sonar. The above ground for opposition is therefore not valid in respect of this request, as accepted by the appellant.

*Sufficiency of disclosure (Article 100(b) EPC)*

3. Claim 1 specifies that the searching and neutralising unit comprises a transponder/responder which transmits signals in response to the searching rays transmitted by the sonar. These response signals are registered on the sonar display and used for remote control of the searching and neutralising unit along the searching rays of the sonar towards the sub-sea object. On the basis of the relative positions on the sonar display of the signals received from the searching and neutralising unit and the sub-sea object respectively the former can be guided towards the latter. These features are conventional and corresponding features are contained in claim 7. The present patent adds the feature of controlling the time of transmission of the response signal from the transponder/responder in order that it is received within a time interval set by the sonar for receiving the echo signals from the sub-sea

object. Whilst the searching and neutralising unit is closer than the sub-sea object to the sonar the transmission is delayed. As the searching and neutralising unit travels closer to the sub-sea object the delay is reduced, thereby causing the registered response signal to remain visible on the display screen. The sonar operator places a cursor over the registered response signal on the sonar display and thereby informs the system of the relative positions of the respective displayed signals.

4. The delay has the effect that movement of the searching and neutralising unit towards the sub-sea object would result in little or no change in the relative positions of the response and echo signals on the sonar display. The appellant argues that as a result the representation of the signals on the display could not be used as the basis for steering the searching and neutralising unit towards the sub-sea object. It further argues that although it would be necessary for the delay time to be calculated and indicated on the sonar display this is not disclosed in the patent specification.

- 4.1 It is a feature of the present invention that the searching and neutralising unit is tracked at least up to the point of entry into the sonar ray using the hydrophones. It follows that whilst the searching and neutralising unit is being tracked in this way its position is known and the time delay necessary to allow the response signal to be registered on the sonar display may be easily calculated. During this time a combination of the delay determined by the system on the basis of the known position of the searching and

neutralising unit and any change in relative position of the respective signals on the sonar display would provide the system with sufficient information to determine a desired course for the searching and neutralising unit. This is not explained in the patent specification but in the Board's view the skilled person presented with the specification would readily recognise on the basis of his technical knowledge how this aspect of the system would operate. Indeed, this aspect has not been challenged by the appellant.

4.2 The patent specification is also silent as regards how the system is able to calculate the appropriate delay once the searching and neutralising unit moves out of range of the hydrophones. In the Board's view it would fall within the normal ability of the skilled person to provide a system which uses the history of the searching and neutralising unit's trajectory and of the corresponding delays which have been applied to the transmission of the response signal in order to determine an appropriate subsequent value of the delay.

4.3 The appellant's objection concentrates on the essentially unchanged location of sequential registered response signals on the sonar display and the alleged inability of the system in such a case to determine the actual trajectory of the searching and neutralising unit. However, as described above, the movement of the searching and neutralising unit derives not only from the position of the cursor but also from knowledge by the system of the delay which it has applied to the transmission of the response signal. This feature is not disclosed in the patent specification but is elementary for the skilled person. The Board cannot

agree with appellant's argument regarding lack of disclosure in the patent specification that it would be necessary for the delay time to be calculated and indicated on the sonar display. The display need only allow the operator by means of the cursor to inform the system of the relative position of the searching and neutralising unit and the sub-sea object. The system would be already aware of the delay which it had applied to the transmission of the response signal, thereby enabling it to calculate the true position of the searching and neutralising unit.

5. On the basis of the foregoing the Board concludes that the patent specification does disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art.

*Inventive step (Article 100(a) EPC)*

6. The Board is in agreement with the parties that the closest prior art is disclosed by D1 and corresponds to the preambles of claims 1 and 7. D1 summarises the art relating to the detection, recognition and destruction of under-water mines. According to that art once a sub-sea object has been detected a remotely operated vehicle (ROV) including a navigation system comprising a gyro-compass is launched from the mother ship and navigated into the beam of the ship's sonar and with the help of the sonar is brought into close proximity with the sub-sea object. Following visual identification of the object as a mine the ROV lays an explosive charge close to the object, is recovered or at least moved to a safe distance and the charge is detonated to destroy the object. This process is time

consuming, primarily because of the need to recover the ROV.

6.1 The method according to present claim 1 differs from that of the prior art by the characterising features:

- the transponder/responder comprises means for transmission of an additional acoustic signal, the transducer of the sonar having located thereon a plurality of hydrophones for receiving the additional acoustic signal and the sonar having means for measuring the signal phase or time delay of signals from the hydrophones for determination of the position of the searching and neutralizing unit in the horizontal plane and/or the vertical plane for guiding the searching and neutralizing unit from the launching area into the covering area;
- means for controlling the transmission of signals from the transponder/responder to include a selective code and with a control in time causing the transmitted signals to be received by the sonar within a time interval set by the sonar for receiving the echo signals and to be displayed on the display to be distinguishable from the echo signals; and
- the searching and neutralizing unit is a non-returnable weapon.

6.2 The essential problem to be solved is to reduce the time required to destroy a sub-sea object. It is clear that the non-returnable aspect of the searching and neutralising unit provides a solution to this problem

because the unit need not be recovered or retired to a safe distance before detonation of the destructive charge. B5 contains on page 92 a suggestion that miniature submersible craft developed for the civil offshore industry might be deployed as expendable vehicles for military use. However, it addresses neither the problem of reducing the time requirement for destruction nor the necessary adaptation of the vehicles and/or associated systems.

- 6.3 One problem to be addressed in using an expendable vehicle is how it is to be navigated in view of the desirability of it being a low cost unit and therefore not including such equipment as a gyro-compass. According to the present patent the searching and neutralising unit may be tracked initially using the hydrophones and then once it has entered the sonar beam by delaying the transmission of the coded response signal in order to register it on the sonar display within the time interval set for receiving the echo signal from the sub-sea object. In accordance with conventional practice the operator would set the covering area of the sonar beam either to include the searching and neutralising unit, resulting in poor definition, or to offer optimum definition but initially unable to show both the searching and neutralising unit and the sub-sea object. The presently claimed feature enables the searching and neutralising unit to be tracked on a display offering optimum definition but whilst it is still outside of the covering area. The appellant argues that the skilled person having set the covering area of the sonar beam in the conventional way has only two options in order to show the response signal on the display, either to

delay transmitting the signal from the transponder/responder or, preferably, to delay its display after receipt by the mother vessel and that both are obvious in the light of his technical knowledge. However, no prior art cited by the appellant addresses the problem of tracking an object using sonar whilst it is outside of the sonar's set covering area and the appellant's assessment relies on an *ex post* analysis of the case.

- 6.4 The Board concludes from the foregoing that the subject-matter of claim 1 is not rendered obvious by the cited prior art and so involves an inventive step.
- 6.5 As acknowledged by the appellant, the subject-matter of apparatus claim 7 corresponds to that of method claim 1 and the above conclusion applies also to that claim. Since claims 2 to 6 and 8 to 12 contain all features of claims 1 and 7 respectively the same conclusion applies also to those claims.



**Order**

**For these reasons it is decided that:**

1. The decision under appeal is set aside.
2. The case is remitted to the department of first instance with the order to maintain the patent in the following version:
  - claims 1 to 12 and description filed as auxiliary request during the oral proceedings;
  - drawings as granted.

The Registrar:

The Chairman:

A. Vottner

S. Crane