THE JOINT EXAMINATION BOARD

PAPER P4

AMENDMENT OF SPECIFICATIONS FOR UNITED KINGDOM PATENTS
IN REVOCATION PROCEEDINGS

10th March, 1992

3.00 p.m. - 5.00 p.m.

Please read the following instructions carefully. This is a TWO HOUR paper.

1. Write on one side of the paper only using BLACK ink. You must write your examination number and the designation of the Paper in the top right hand corner of the sheet. You must NOT state your name anywhere in the answers.

2. NO printed matter or other written material may be taken into the examination room.

THE JOINT EXAMINATION BOARD

PAPER P4

This paper comprises:

1. Instructions to candidates.

2. Specification of the patent, including description, claims and drawings (four sheets).

3. A letter from your client.

4. Statement of Grounds.

5. Prior art Document A (with one sheet of drawings).

6. Prior art Document B (with one sheet of drawings).

In this paper, you should assume that a UK patent comprising the attached documents[1] is the subject of an application for revocation under Section 72 of the Patents Act 1977.

You should accept the facts given in the paper and base your answer upon the facts.

You should not make use of any special knowledge that you may have of the subject matter of the invention, and you are to assume that the prior art referred to is exhaustive.

Your task is to prepare a reply to the letter from your client, to include:

1. a draft counterstatement to be submitted to your client for review prior to filing at the Patent Office.

2. amended pages of the specification of your client's patent, showing the amendments proposed to overcome any perceived invalidity.

3. a memorandum consisting of notes to provide the basis of a letter of advice to your client, **restricted to** matters relating to the revocation proceedings and the validity of the patent. You are **not** required to consider any other matters, such as infringement of patent or copyright, other than to ensure that optimum protection is obtained for your client's invention from his patent.

You should bear in mind, when drafting your response, that the claims should afford the maximum valid protection that is available, and that will be of greatest commercial value to your client.

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[1] These documents do not necessarily constitute the only or best solution to the task set in Paper P3.

Any amendments should be clearly indicated as insertions or deletions. They may be indicated as a schedule of amendments on a separate sheet of paper, or in manuscript on the pages of the specification of the patent as granted, or in combination of these ways, or in some other way which makes the nature of the amendments absolutely clear to the Examiners.

# A MARINE TETHER ANCHOR ASSEMBLY

The present invention relates to a marine tether anchor assembly.

Marine tethers are used to fix offshore oil installations in position relative to the sea-bed. Anchors for such tethers must be capable of withstanding the high loads which arise, for example, during adverse weather, and to accommodate changes in the direction of the load which arise, for example, as a result of the effects of wind and tide. It is also desirable that a tether be capable of being disconnected from its anchor, for example for inspection or repair.

A known tether anchor assembly comprises a tether having an expanded end portion which is retained in a cavity in a plug by a closure ring. The plug is received in a socket which is held in an anchor, fastened to the sea-bed and generally cast in concrete, by means of snap rings. The interior of the socket is stepped to define an upper region of relatively small diameter and a lower region of relatively large diameter. The plug has an upper region of relatively large diameter and a lower region of relatively small diameter, and carries a load ring of a springy material around it at the top of the small diameter region.

Assembly of the anchor involves compressing the load ring inwardly so that the plug can be inserted into the small diameter region of the socket. Continued insertion of the plug into the large diameter region of the socket allows the load ring to expand outwardly, to retain the plug in the socket.

The plug can be removed from the anchor in the sea-bed in either of two ways. By releasing the load on the tether and allowing the plug to pass further down into the socket, a wedge shaped release ring located around the plug, on a support ring in the socket, can be made to engage the load ring and to

compress it inwardly so that it can pass into the small diameter region of the socket, allowing the plug to be removed from the socket. Alternatively, hydraulic actuators located in the anchor can be activated to compress the snap rings so that the socket is released from the anchor to be removed with the plug.

A problem which arises in connection with the known marine tether anchor assembly is that there is a risk that the release ring and the load ring can engage one another during insertion of the plug into the socket. Furthermore, the establishment by divers of a connection permitting supply of fluid for the hydraulic actuators is not possible below diver-depth (where anchor assemblies are often located) and, when it can be established, can be vulnerable to damage.

The present invention provides a marine tether anchor assembly in which mechanical connection is formed automatically between a socket and a plug connected to a hollow tether when the plug is inserted into the socket, which can be released by changing the pressure in fluid contained within the core of the tether.

Accordingly, in one aspect, the invention provides a marine tether anchor assembly which comprises:

(a) a tether, which is hollow and has a continuous channel extending along its core,

(b) a plug connected to the tether at its end, whose configuration can be varied between a first contracted configuration and a second expanded configuration,

(c) a socket for installation in the sea-bed, which presents a locking surface to the plug when the plug is inserted into the socket and in its expanded configuration, and

(d) means responsive to the supply of fluid under pressure to the core of the tether, to cause the configuration of the plug to change from the expanded configuration in which it engages the locking surface of the socket towards the contracted configuration in which it can be withdrawn from the socket.

The assembly of the present invention has the advantage that disconnection of the plug from the socket requires an operator to change the pressure of fluid in the core of the tether. This technique for breaking the connection between the plug and the socket in this way is more reliable and controllable than techniques which use mechanically engaging components such as wedges.

Furthermore, the use of the tether as the conduit for the supply of a fluid whose pressure is changed to initiate breakage of the connection between the plug and the socket removes the need to provide a separate fluid supply line to an anchor assembly. This factor therefore makes the assembly of the invention convenient to install and the vulnerability to damage of a separate fluid supply line is therefore removed.

Preferably, the plug comprises a collet which includes a load ring which is expandable, for example by being segmented, to engage the locking surface on the socket, and a body portion which the collet acts against when the plug is in its expanded configuration, the change in the configuration of the plug between its expanded and contracted configurations involving relative movement between the collet and the body portion. The body portion will generally include a load surface which the load ring acts against when the plug is in its expanded configuration, the locking surface on the socket, the load surface on the body portion, and the load ring collet being arranged so that, when the assembly is under load, load is transmitted between the tether and the socket through the load ring. In this way, the part of the collet which serves as the

load ring is subjected to a compressive load between the load surface of the body portion of the plug and the locking surface on the socket when the assembly is under load. This feature has the advantage that the strength of the connection between the plug and the socket is not dependent on the ability of the collet to withstand a tensile load as is the case with the previously used structures in which fingers of a collet are placed under tension along their length. This is particularly significant since it obviates a disadvantage arising from the design of the collet to be capable of expansion, which can result in a reduced ability of the portion to withstand a longitudinal load.

Preferably, the body portion of the plug includes a wedging surface, the load ring moving along that surface in contact therewith into contact with the load surface as the configuration of the plug changes from the contracted configuration towards the expanded configuration. The wedging surface may be defined by a recess at the end remote from the load surface, which the load ring can engage when the plug is in its contracted configuration.

Pressure in the core of the tether can be caused to change by means of an appropriate pump, located at a convenient location for example at the sea surface, such as on the structure which is anchored by the anchor assembly.

Preferably, the plug comprises a piston and cylinder assembly, one of the piston and the cylinder being provided on the body portion of the plug, and the other being provided on the collet, the core of the tether communicating with the cylinder so that a change of pressure in the fluid in the core causes the piston to move in the cylinder and the load ring to move relative to the body portion of the plug. For example, the piston may form part of the collet of the plug, and the cylinder form part of the body portion. The piston and cylinder assembly may be arranged to cause the configuration of

the plug to change from the expanded configuration towards the contracted configuration by an increase in the pressure in the core of the tether, or by a reduction. When the piston forms part of the collet of the plug and the cylinder forms part of the body portion, an increase in the pressure can be arranged to force the collet downwardly relative to the body portion to cause the change in configuration.

The tether will generally have an expanded end portion, and the body portion of the plug will generally have a cavity at its upper end for receiving the expanded end portion of the tether to form a connection between the tether and the plug. The expanded end portion of the tether is retained in the cavity by means of a closure ring, which is retained tightly on the body portion of the plug. Preferably, load is transmitted between the tether and the socket through the said closure ring, which then provides the said load surface and is placed under compression between the expanded end portion of the tether and the socket. Alternatively, however, the load surface could be provided on the main part of the body portion of the plug.

Embodiments of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a diagrammatic view of a so-called tension leg platform;

Figure 2 is a diagrammatic partly cut-away perspective view of a marine tether anchor assembly according to the invention;

Figure 3 is a sectional elevation of the assembly of the invention in a release condition; and

Figure 4 is a sectional elevation of the assembly of the invention in an operative or locked condition.

Referring to the drawings, Figure 1 shows a tension leg platform 10 over a set of sub-sea foundations 12 of concrete or other suitable material. The platform 10 is maintained in position over the foundations 12 by a plurality of mooring tethers 14. The mooring tethers 14 are joined to the foundations 12 and thereafter are placed in tension e.g. by de-ballasting the platform 10 so that it rises in the water.

Figures 2 to 4 show a generally cylindrical socket 42 set into the sub-sea foundation 12. It defines a cylindrical plug-receiving space 44 having a reduced diameter mouth 46 having on its inner face a conical abutment 48. Within the cavity 44 there are radial fins 50 which carry upper and lower guide rings 52, 54 that serve to position the plug centrally within the space 44. The floor of the space 44 is provided with an upstanding stop member 56 that limits downward travel of the plug. The plug has a body formed in two parts 60, 62 to enable the mushroom head 20 to be inserted into the cavity 21. It has a lower part 60 and an upper part or locking ring 62 tightly bolted to the lower part. The mushroom head 20 of the tether 14 fits below the locking ring 62 to which it is connected by a flex joint 22 as before, the abutment surface 24 being formed on an inner surface of the locking ring 62. The outer surface of the locking ring 62 is formed with an upper larger diameter conical seat 64, a lower smaller diameter conical seat 66 and a cam surface 68 connecting them. Fins 70 project outwardly from the body part 60 and carry guide rings 72, 74. A spring collet 76 surrounds the plug connector body 60 with the fingers 78, between which the fins 70 fit, facing upwardly as shown, and defining at their uppermost ends a segmented load ring 79. The fingers 78 tend to spring inwardly, but are held at their present diameter by engagement with one or other of the surfaces 64, 66 of the locking ring 62. At the hooked ends of the fingers 78 there are provided as part of the load ring inner conical surfaces 80 which snap onto the surfaces 64, 66 and outer surfaces 82 which in the working position of the plug (Figure 4) butt against the socket mouth surface 48. The

collet 76 can slide axially relative to body 60 between the release position shown in Figure 3 and the locked position shown in Figure 4.

The closed lower end of the collet 76 carries an upwardly facing piston 84 which is slidably supported in a bore 86 of the connector body 60 and which has an enlarged head 88. Fluid communication between the interior of the tether 14 and the piston head 88 is provided by a vertical bore 90 through the spherical seat 26.

In use, the tether 14 is lowered so that the plug enters the socket 42. The collet is in its lower (Figure 3) position relative to the body 60 and the load ring 79 is collapsed onto the lower seat 66. The plug moves downwardly until a buffer 92 at the lower end of the plug touches the end stop 56, after which no further downward movement of the collet 76 can take place. The connector body 60 continues to move downwardly under the weight of the tether 14, disengaging the load ring 79 from the surface 66 and allowing it to travel over the surface 68 until it snaps onto the upper surface 64. As this happens the base of the collet thrusts the piston 84 from the position shown in Figure 3 upwardly to the position shown in Figure 4. By this means the device reaches its locked state. As tension is applied to the tether 14, the connector body 60 rises carrying the load ring 79 upwardly until its outer surfaces 82 engage the corresponding surfaces 48 of the socket mouth. Thereafter the end 20 of the tether cannot escape from the socket and the load ring 79, provided by the ends of the fingers 78, is held between the locking ring 62 and the upper end of the socket so that it cannot disengage.

The procedure for unlocking the device is as follows. Tension is removed from the tether 14 to allow the connector body 60 and collet 76 to move downwardly within the socket 14. Fluid is then pumped down the interior of the tether 24 and flows through the central bore 90 in the spherical seat 26. The

fluid drives the piston 84 downwardly which forces the collet 76 downwards disengaging the load ring 79 from the upper surface and allowing it to snap back onto the lower surface 66. The load ring has now returned to its collapsed state in which the collet and body can pass out of the socket when tension is re-applied to the tether 14.

In the normal load-carrying state of the device, the distance between the mushroom head 20 of the tether and the mouth 46 of the socket is relatively small, and everything between them is in compression.

CLAIMS:

1. A marine tether anchor assembly which comprises:

(a) a tether, which is hollow and has a continuous channel extending along its core,

(b) a plug connected to the tether at its end, whose configuration can be varied between a first contracted configuration and a second expanded configuration,

(c) a socket for installation in the sea-bed, which presents a locking surface to the plug when the plug is inserted into the socket, and in its expanded configuration, and

(d) means responsive to the supply of fluid under pressure to the core of the tether, to cause the configuration of the plug to change from the expanded configuration in which it engages the locking surface of the socket towards the contracted configuration in which it can be withdrawn from the socket.

2. A marine tether anchor assembly as claimed in claim 1, in which the plug comprises a collet which includes a load ring which is expandable to engage the locking surface on the socket, and a body portion which the load ring acts against when the plug is in its expanded configuration, the change in the configuration of the plug between its expanded and contracted configurations involving relative movement between the collet and the body portion.

3. A marine tether anchor assembly as claimed in claim 2, in which the body portion includes a load surface which the load ring acts against when the plug is in its expanded configuration, the locking surface on the socket, the load surface on the body portion, and the load ring being arranged

so that, when the assembly is under load, load is transmitted between the tether and the socket through the load ring.

4. A marine tether anchor assembly as claimed in claim 2 or claim 3, in which the body portion of the plug further includes a wedging surface, the load ring moving along that surface in contact therewith into contact with the load surface as the configuration of the plug changes from the contracted configuration towards the expanded configuration.

5. A marine tether anchor assembly as claimed in any one of claims 2 to 4, in which the plug comprises a piston and cylinder assembly, one of the piston and the cylinder being provided on the body portion of the plug, and the other being provided on the collet, the channel in the tether communicating with the cylinder so that a change of pressure in the fluid in the channel causes the piston to move in the cylinder and the load ring to move relative to the body portion of the plug.

6. A marine tether anchor assembly as claimed in claim 5, in which the piston forms part of the collet of the plug, and the cylinder forms part of the body portion of the plug.

7. A marine tether anchor assembly as claimed in any one of claims 2 to 6, in which the collet comprises a plurality of fingers whose ends define the load ring, the fingers extending upwardly.

8. A marine tether anchor assembly as claimed in any one of claims 1 to 7, in which the tether has an expanded end portion, and the body portion of the plug has a cavity at its upper end for receiving the expanded end portion of the tether to form a connection between the tether and the plug, the expanded end portion of the tether being retained in the cavity by means of a closure ring.

9. A marine tether anchor assembly as claimed in claim 8, in

which load is transmitted between the tether and the socket through the said closure ring which is placed under compression between the expanded end portion of the tether and the socket.

10. A marine tether anchor assembly as claimed in claim 1, substantially as hereinbefore described with reference to, and as illustrated in, Figures 2 to 4 of the accompanying drawings.

FIG.1

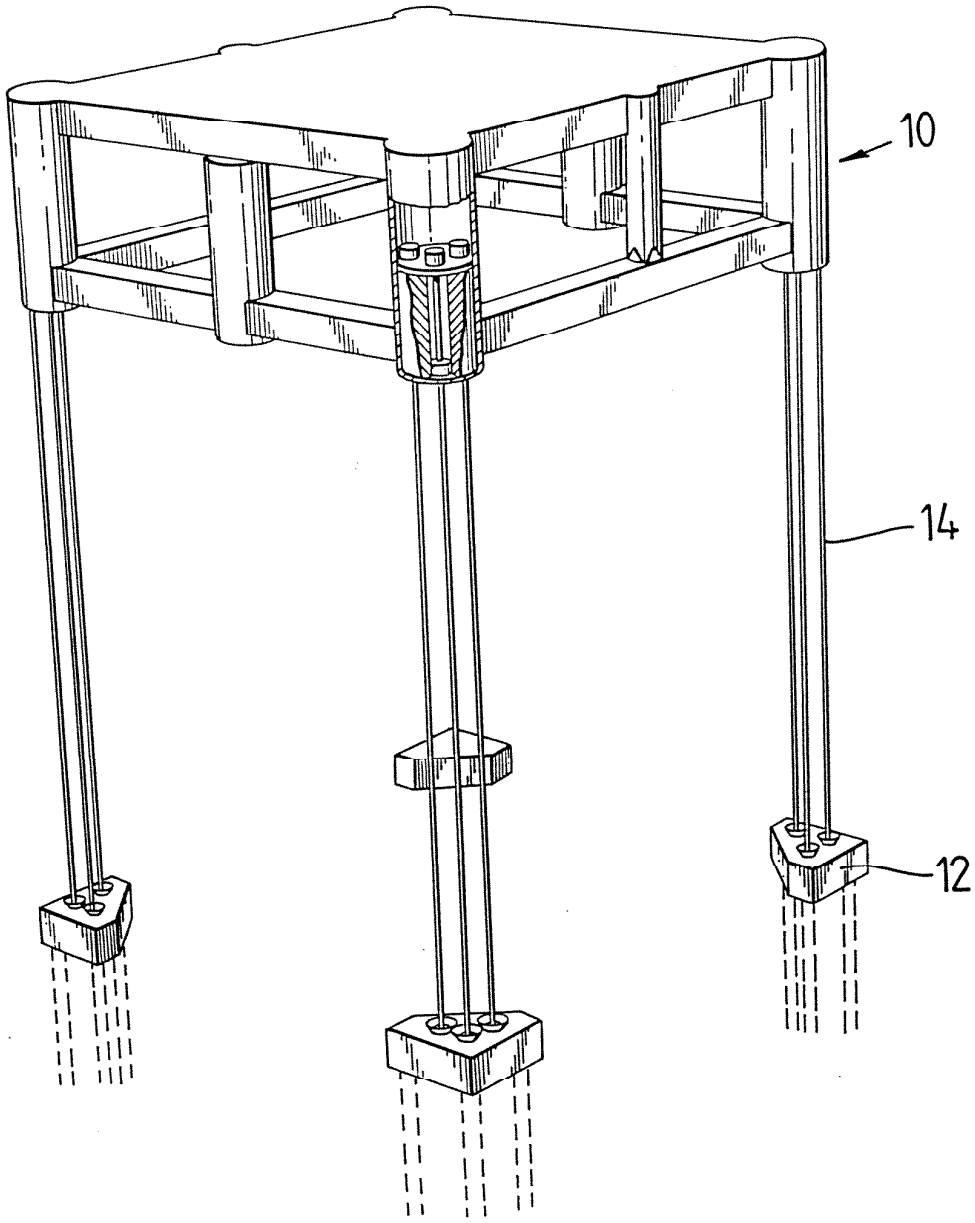


FIG. 2

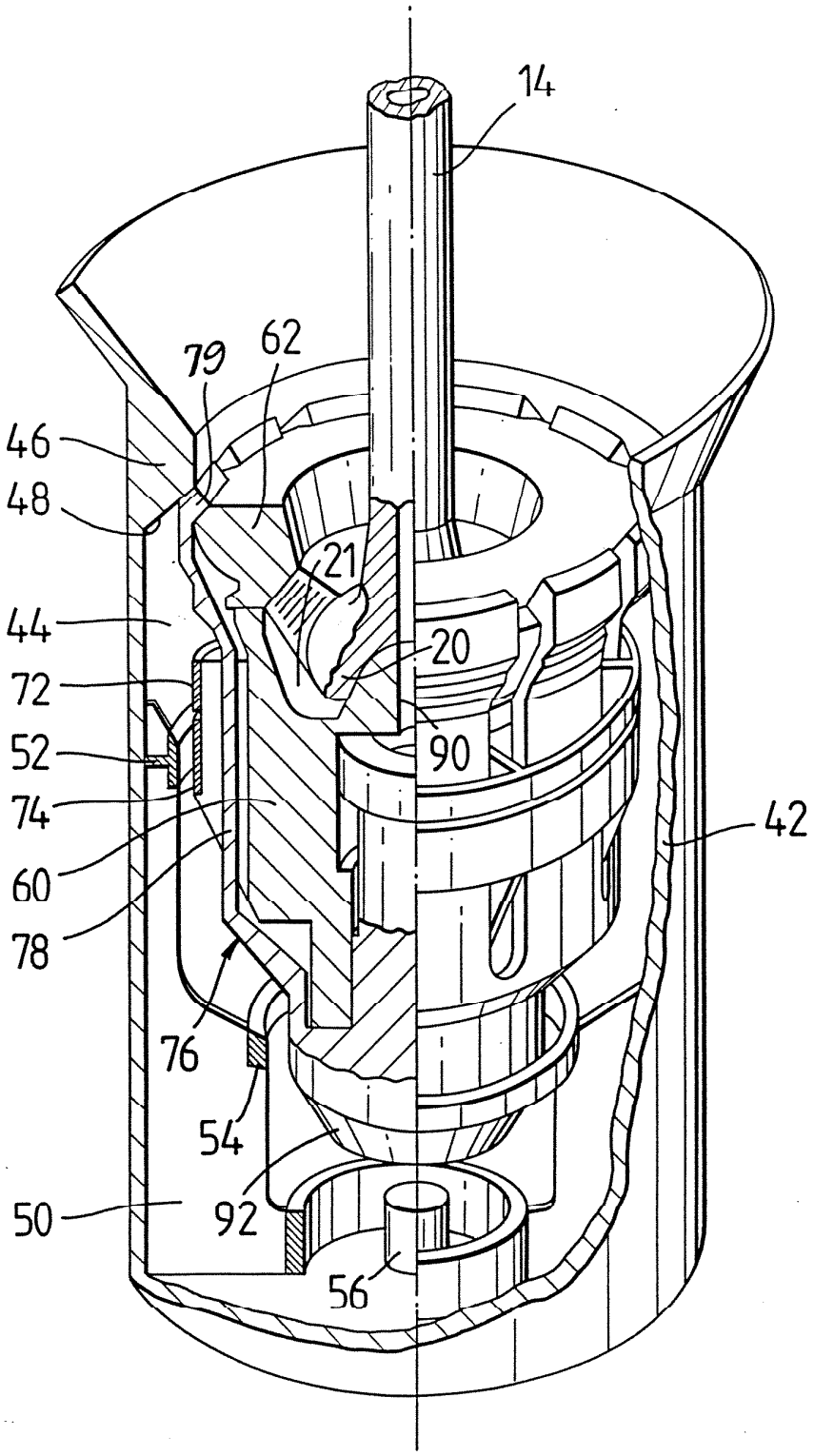


FIG.3

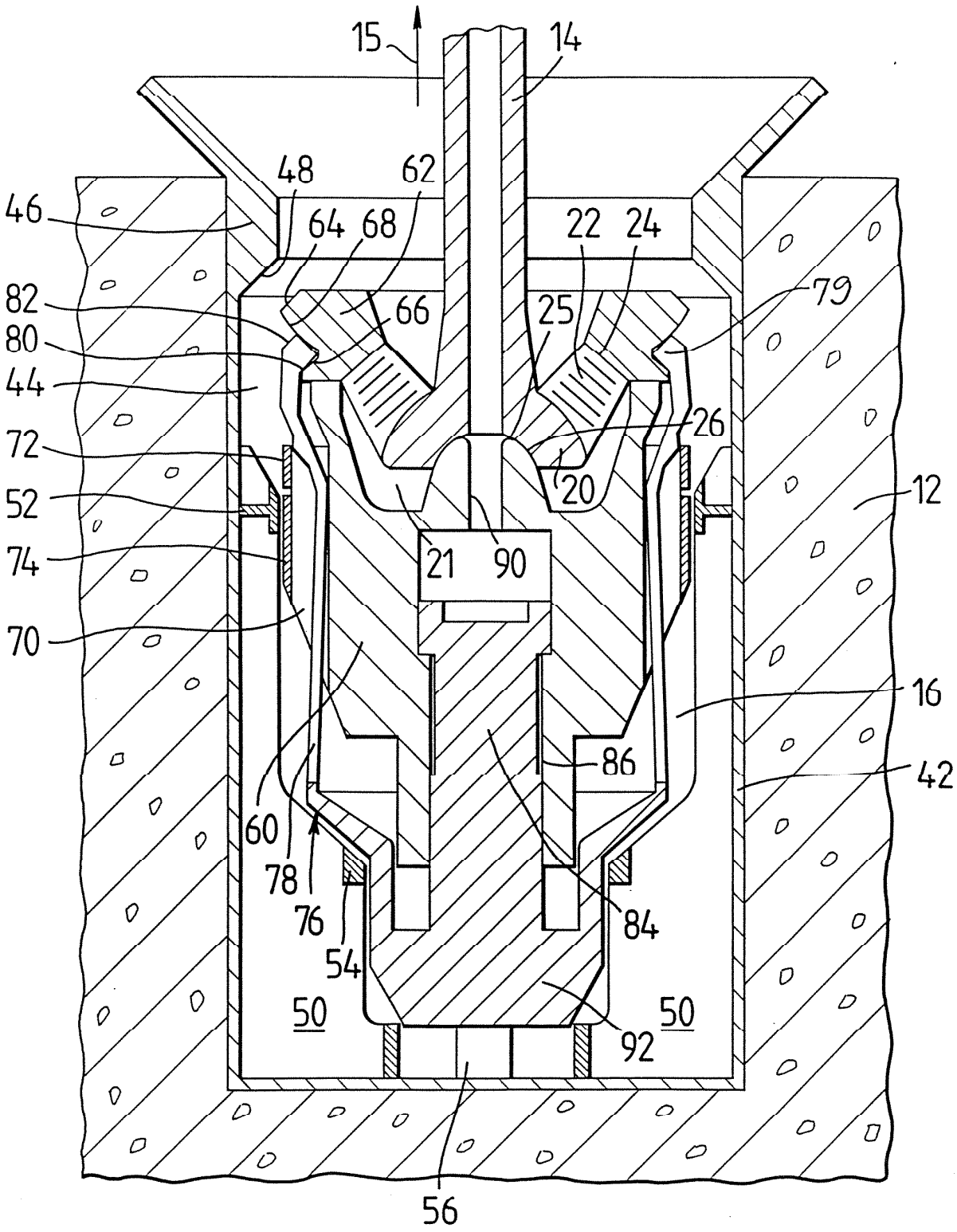
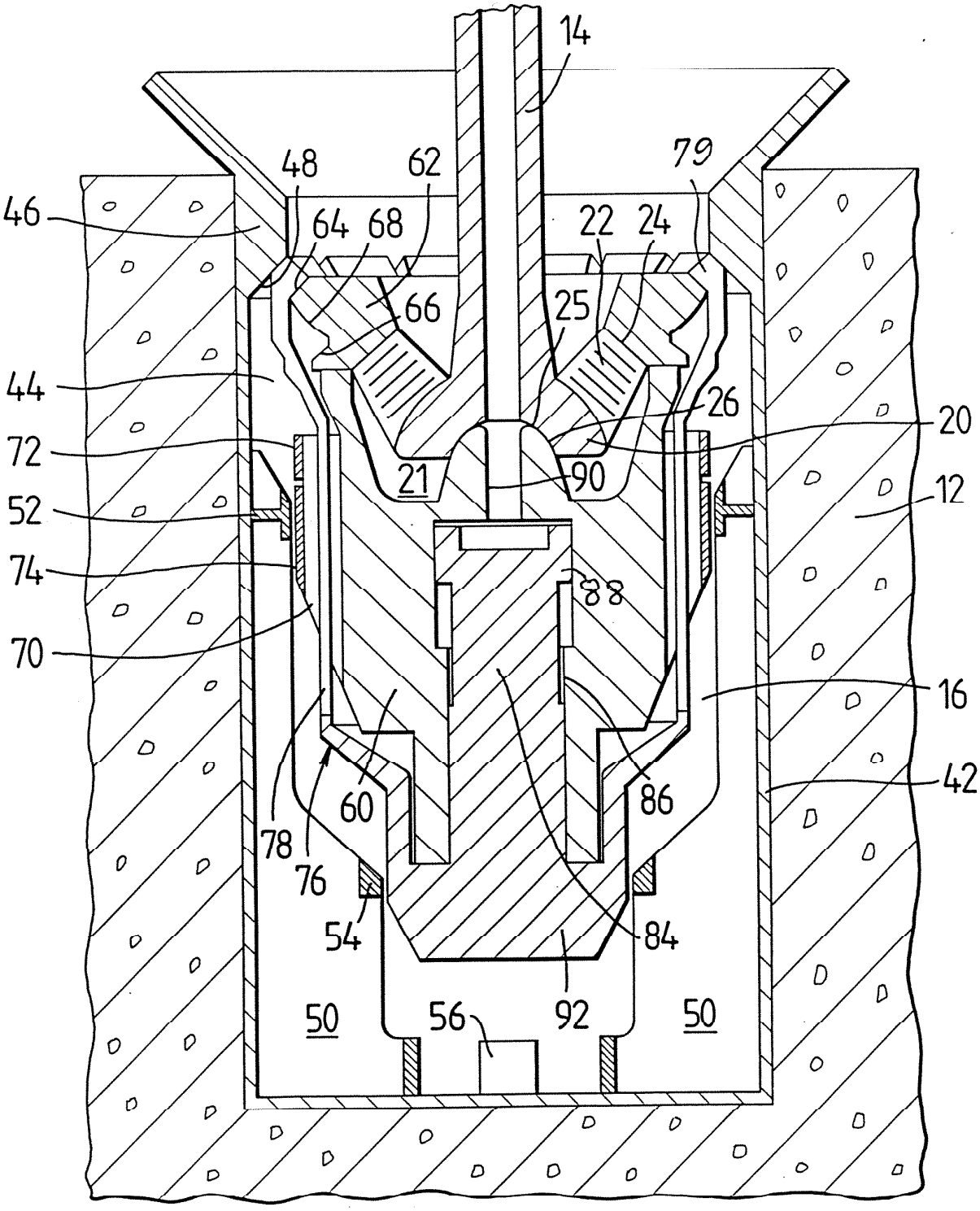


FIG. 4



Mr John Smith
A B & C
123 High Street
Anytown

Anchors Unlimited
Newbridge Industrial Estate
Anytown

11 September 1991

Dear Mr Smith

Re: UK Patent no. 2000000B
Marine Tether Anchor Assembly

I write to ask for your assistance.

Several years ago, we obtained a patent for our design of marine tether anchor assembly. Sales of the product have been healthy since the beginning, and we have enjoyed a significant share of the relevant market for a number of years.

At a trade show last month, I met Mr Jones, the managing director of a company which we expect to enter the market in competition with our anchor assembly. Mr Jones' product will be functionally the same as our product, although Mr Jones indicated that his product may for some applications be arranged for use with a solid tether line having a fluid delivery line attached to it along its length.

I referred Mr Jones to our patent, and he indicated that he was aware of it saying that he considered it to be invalid. He clearly meant it, since I received yesterday from the Patent Office copies of papers which he has filed in an application for revocation of the patent.

Enclosed with this letter are:

1. a copy of the specification of the patent.

2. a copy of the statement which appears to set out the substance of the revocation application.

3. copies of two documents which were published before the filing date of the application for our patent.

I presume that it will be necessary to amend the specification of our patent, and I should be grateful if you would consider the specification as it is currently drafted to identify an

appropriate amendment to cure any invalidity. From a brief review, I notice that the fingers in the anchor assembly disclosed in Document B are placed under a compressive load along the fingers by the wire. I am sure that there are other differences that we might exploit, but I do consider that this feature is somewhat different from the feature specified in claim 9 of our patent.

Perhaps you could prepare a draft response to the Patent Office dealing with the points that Mr Jones has raised, and show me how the specification might be amended to overcome the objections raised by Mr Jones and to maintain optimum protection for our product.

Yours sincerely

PATENTS ACT 1977

IN THE MATTER OF an application for revocation of UK Patent Number 2000000B

STATEMENT OF GROUNDS

1. The invention claimed in the Patent is not patentable.

(a) Document A discloses a marine tether anchor assembly having the features which are specified in claims 1 to 6 and 8. The assembly defined in those claims is therefore not new.

(b) Document B discloses an anchor assembly which comprises a plurality of fingers whose ends extend upwardly to engage a locking surface of a socket, installed in the ground. The assembly defined in claim 7 therefore lacks an inventive step having regard to what is disclosed in Documents A and B.

2. The specification of the Patent does not disclose the invention sufficiently clearly and completely for it to be carried out by a person skilled in the art.

(a) It is not possible to determine what the invention is because of the vagueness of the term "means responsive to the supply of fluid".

(b) The only construction of assembly which is disclosed in the specification of the Patent makes use of a piston on the collet and a cylinder on the body portion of the plug. There is no information concerning any other constructions of the assembly, so claim 1 should include these features, currently in claims 5 and 6.

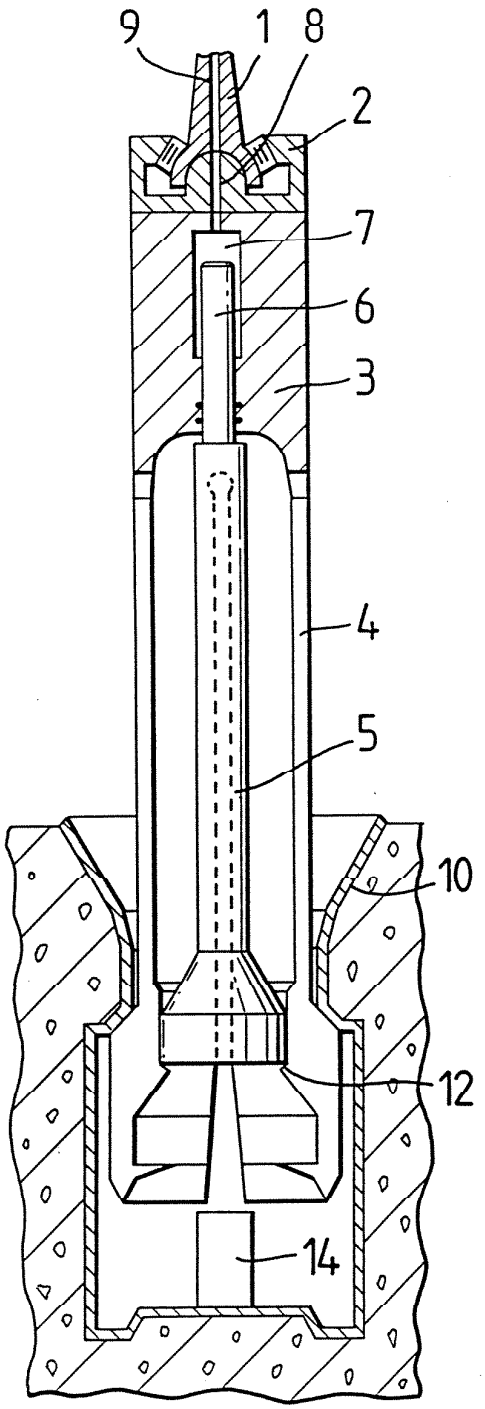
DOCUMENT A

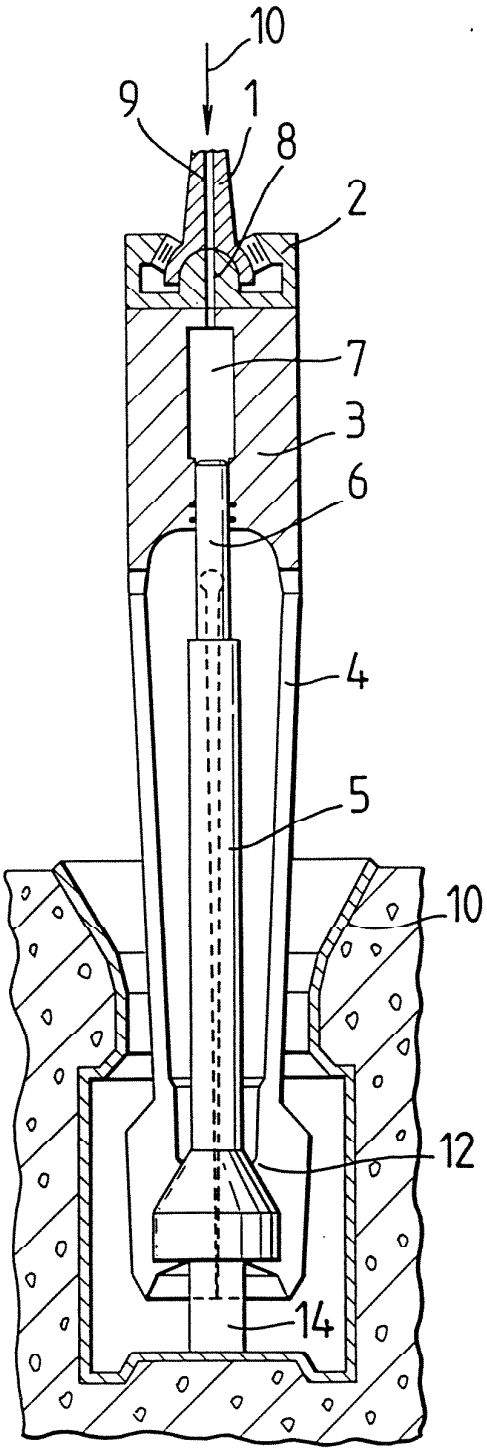
This invention relates to Marine Tether Anchoring Devices.

According to the invention there is provided an anchoring device for a marine tether for use with an anchoring chamber. The device comprises a hollow segmented spring collet having adjacent its extreme end a locking portion defining an internal cavity. A hollow passage extends through the collet and a locking plug extends along the hollow passage and has an end of increased width which fits in the enlarged cavity for movement between a first position in which the collet is expanded and locked within the cavity and a second position in which the collet contracts and can be connected to or released from the cavity.

In the drawings, a marine tether 1 is connected by a flex joint assembly 2 to a spring collet 3 whose depending fingers 4 define a locking portion 4a which can be inserted into and removed from a seabed anchoring chamber or socket 10. The fingers are naturally in the contracted state shown in Figure 2 but a plug 5 guided by a stem 6 is movable from the release position shown in Figure 2 to the locking position shown in Figure 1 where it has expanded the collet fingers 4 and locking portion 4a so that they can no longer be removed from the anchoring chamber 10. As the fingers 4 are loaded into the anchoring chamber 10, a member 14 upstanding from the floor of the chamber 10 pushes the plug 5 into the locking position of Figure 1 where it latches behind the small flange 12 on the inside of the collet which is thereafter held in position. Release is carried out be de-tensioning the tether line 1 and pumping fluid down the hollow central bore 9 of the tether line 1 and through a bore 8 in the members 2 and 3. The fluid enters a cavity 7 at the top end of the collet and forces the guide rod 6 of the plug 5 which acts as a piston downwardly, causing the plug to move to the Figure 2 position.

# DRAWINGS FOR DOCUMENT A



DOCUMENT B

An anchoring device is shown for connecting support wires of a communications mast or similar tall fragile structure to a ground anchoring point. The wire 10 is connected to a ground anchor 12 which has a socket cup 14. The mouth of the socket 14 is formed with an internal lip 16 which is hooked as shown. A spring collet connector 18 has an integrally formed threaded tie rod 20. A conical nut 22 which travels on the tie rod 20 expands three fingers 24 of the collet so that it can no longer be removed from the socket 14, as shown in the drawing. The tie rod 20 also provides a threaded connection for the end of the wire 10.

# DRAWING FOR DOCUMENT B