COMMONWEALTH of AUSTRALIA
PATENTS ACT 1952

APPLICATION FOR A STANDARD PATENT

Kx
We

SOLETANCHE,
of 6, rue de Watford,
92005 NANTERRE
FRANCE

hereby apply for the grant of a Standard Patent for an invention entitled:

"ARRANGEMENT FOR UNDERWATER DRILLING OF FOUNDATIONS"

which is described in the accompanying specification.

Details of basic application(s):—

<table>
<thead>
<tr>
<th>Number</th>
<th>Convention Country</th>
<th>Date</th>
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<tbody>
<tr>
<td>86 05529</td>
<td>FRANCE</td>
<td>17th April 1986</td>
</tr>
</tbody>
</table>

The address for service is care of DAVIES & COLLISON, Patent Attorneys, of 1 Little Collins Street, Melbourne, in the State of Victoria, Commonwealth of Australia.

Dated this 16th day of APRIL 1987

To: THE COMMISSIONER OF PATENTS

H. H. Rimington
(a member of the firm of DAVIES & COLLISON for and on behalf of the Applicant).

Davies & Collison, Melbourne and Canberra.
COMMONWEALTH OF AUSTRALIA
PATENTS ACT 1952-1973
DECLARATION IN SUPPORT OF CONVENTION OR NON-CONVENTION APPLICATION FOR A PATENT OR PATENT OF ADDITION

In support of the Application made for a patent
entitled: "ARRANGEMENT FOR UNDERWATER DRILLING OF FOUNDATIONS"
by Jean Grange,
of SOLETANCHE,
OF 6, rue de Watford, 92005 Nanterre, FRANCE
do solemnly and sincerely declare as follows:

1. (a) The actual inventor(s) are SOLETANCHE
or (b) I am authorized by SOLETANCHE to make this declaration on its behalf.

2. (a) The applicant is Jean Grange, of SOLETANCHE
or (b) Herve BARTHELEMY, of 43, rue des Ponts, 78290 CROISSY SUR SEINE;
Karl BOLLINGER, of 19 rue Eugene Sue, 92500 RUEIL MALMAISON;
Michel BROCHIER, of 7, rue du Hameau des Joncherettes, 91100 PALAISEAU;
Maurice GAU, of 49, Avenue du Vercors, 78310 MAUREPAS; and
Yves LEGENDRE, of 22, rue des Patures, 77118 BALLOY;
all of FRANCE respectively.

State manner in which applicant(s) are entitled to make the application are as follows:

The applicant would if a patent were granted on an application made by the said inventors be entitled to have the patent assigned to it.

3. The basic application as defined by Section 141 of the Act was made in FRANCE on the 17th April 1986.

4. The basic application referred to in paragraph 3 of this Declaration was the first application made in a Convention country in respect of the invention the subject of the application.

Declared at Nanterre this 11th day of May 1987
by
Jean GRANGE
Directeur Technique et Financier

S.A. au capital de 38,000,000 de F:
Siège Social :
6, rue de Watford
92000 NANTERRE
FRANCE
Claim 1. Arrangement for underwater drilling of foundations, comprising at least one cutter (27) and one pump (29) for discharge of excavated material, and hydraulic motors for driving the said cutter and the said pump, characterized in that it comprises a hydraulic turbins (16) capable of operating with the aid of a fluid such as sea water, a hydraulic plant (23, 24) driven by the said turbine and designed for feeding the said hydraulic motors, and a head forming a first distribution box (15) for feed of the turbine and discharge of excavated material, the said head being linked by a two-line pipe (14) to a second distribution box (13), connected on the one hand to means (2) for furnishing the fluid feeding the turbine, and on the other to a hose (18) for evacuation of excavated material.
The following statement is a full description of this invention, including the best method of performing it known to us:

"ARRANGEMENT FOR UNDERWATER DRILLING OF FOUNDATIONS"
The following statement is a full description of this invention, including the best method of performing it known to us:—
ARRANGEMENT FOR UNDERWATER DRILLING OF FOUNDATIONS

SUMMARY AND BACKGROUND OF THE INVENTION

The present invention concerns an arrangement for underwater drilling of foundations and, more particularly, an arrangement of the type comprising at least one cutter and a pump for discharge of the excavated material, and hydraulic motors for driving the said cutter and the said pump.

The exploitation of hydrocarbon beds at great depth increasingly calls for production platforms requiring the use of very heavy duty anchoring points. This is the case, for example, in so-called "taut cable" platforms.

Such anchoring points, capable, for example, of absorbing vertical or horizontal forces of the order of 1000 or 2000 tons, require construction in the bottom, under several hundreds of meters of water, of piles several square meters in section and several dozen meters in height, and therefore require the construction of corresponding boreholes.
Since rotary drilling is excluded for constructing such anchoring points, other solutions have already been proposed.

Thus, French Patent Application No. 85 14939 describes an arrangement comprising:

- a drilling apparatus having a head linked by a hydraulic advancing jack to a member equipped with cutters, said apparatus being additionally equipped with a pump for discharge of excavated material and with hydraulic motors for driving the cutters and the pump;

- a rigid tubular assembly comprising a pipeline for discharge of excavated material and pipelines for supplying the jack and the motors with hydraulic fluid;

- means of connection between the head of the drilling apparatus and the lower end of the tubular assembly;

- means of support placed on the sea floor in drilling head, designed to support means of locking the tubular assembly and
- means of suspension of the arrangement from a ship; means being provided for the supply of hydraulic fluid, and connecting pipes being provided between these means of supply of fluid and the end of the tubular assembly.

This arrangement, however, is limited, at very great depth, by the weight and the cost of the tubular assembly, and by the power required to secure the circulation of hydraulic fluid.

The present invention is designed to furnish a drilling arrangement better suited to very great depths.

For this purpose, the subject of the invention is an arrangement for underwater drilling of foundations, comprising at least one cutter and one pump for discharge of excavated material, and hydraulic motors for driving the said cutter and the said pump, characterized in that it comprises an hydraulic turbine capable of functioning by means of a fluid such as sea water, and an hydraulic power plant driven by the said turbine and designed to feed the said hydraulic motors.
Unlike heretofore, the arrangement according to the invention therefore comprises its own power plant, consisting of the hydraulic plant. The primary energy is supplied very simply from the service ship in the form, for example, of sea water under pressure, which may be obtained, for example, by means of mud drilling pumps with which all drilling ships are equipped.

In addition, the power necessary is considerably reduced since there is no longer any circulation of hydraulic fluid between the arrangement and the surface, but only injection at the inlet of the turbine of fluid such as sea water under pressure, which is then evacuated at the bottom of the borehole.

Moreover, it will be noted that the arrangement according to the invention requires no transfer of electric power between the surface and the bottom and consequently avoids the use of a heavy duty cable which presents problems difficult to solve because of the depth of exploitation considered.
In a preferred embodiment, the arrangement according to the invention comprises two cutters with horizontal shafts turning in reverse direction.

To accomplish regulation of the speed of the turbine as simply as possible, there may be provided a discharge valve opening under the effect of an increase in pressure at the inlet to the turbine caused by excessive speed.

The discharge of the turbine preferably is directed over the tools of the cutter, so as to secure cleaning thereof.

The hydraulic plant may comprise a plurality of hydraulic pumps, for example one per motor, driven by the said turbine by way of a mechanical distribution box.

In one particular embodiment, the arrangement according to the invention may comprise a head forming a first distribution box for feed of the said turbine and discharge of the excavated material.
This head may be linked to the body of the arrangement by at least one advancing jack fed by the said hydraulic plant.

The head may in addition be linked by a two-line pipe to a second distribution box connected, on the one hand, to means for supplying the fluid feeding the turbine and, on the other, to a hose for evacuating excavated material.

There will now be described, by way of non-limiting example, a particular embodiment of the invention, in reference to the accompanying schematic drawings, wherein

- Figure 1 is a general view of the arrangement according to the invention, and of a ship from which it is put into operation, and

- Figure 2 is a view in elevation of the turbine/hydraulic plant assembly of the arrangement.
Figure 1 represents, in a general way, the drilling apparatus 1, linked by a pipe train 2, of the drill pipe type, to a service ship 3 which may, for example, be a dynamic positioning vessel.

The pipe train 2 is suspended from the ship by its upper part by means of a manoeuvering winch 4. In addition, the ship 3 carries a pump 5 of the mud pump type, linked by means of a hose 6 to an injection head 7 for the fluid under pressure, for example, sea water, in the pipe train 2.

A winch 8 permits the unwinding of a low-power electric cable 9, permitting feed of the electric members, such as the measuring instruments, the apparatus 1, and another winch 10 permits the unwinding of another electric cable 11, likewise low-power, permitting feed of the electric jacks of the guiding and locking means 12 to be described below.
The pipe train 2 is terminated at its lower part by a distribution box 13 linked by a two-line pipe 14 to another distribution box 15.

The two-line pipe 14 is made up of, for example, two concentric pipes.

The line of the pipe 14 coming, by way of the distribution box 13, from the pipe train 2, is directed toward an hydraulic turbine 16, by way of the distribution box 15 and a flexible line 17.

The other line of the pipe 14 is linked at its upper part, by way of the distribution box 13, to a hose 18 for evacuation of excavated material and at its lower part, by way of the distribution box 15, to a telescopic pipe 19 for discharge of excavated material.

The pipe 14 has a length such that the distribution box 13 is located above the guiding and locking means 12 when the arrangement 1 is at the bottom of the borehole.
The turbine 16 is equipped with a valve 20 controlled by the inlet pressure of the turbine, i.e., the pressure in the line 17, for regulating the speed of the turbine depending upon the power requirement.

The discharge 21 of the turbine is directed by a pipe, not represented, toward the cutters, which will be described below, to clean the drilling picks.

The rotor of the turbine 16 is linked, by way of a coupling 22, to a mechanical distribution box 23 likewise acting as reducer, and equipped with a plurality of outlets capable of driving an assembly of hydraulic pumps 24.

The primary shaft of the distribution box 23 in addition carries a speed-control means 25.

The distribution box 23, the pumps 24 and the speed-control means 25 are placed in an oil housing 26.

The drilling arrangement 1 in addition comprises two horizontal-shaft cutters 27 turning in reverse direction, so as to guide the excavated material toward an
aspiration nozzle 28 connected to a pump 29 for discharge of excavated material. The outlet of the pump 29 is connected to the discharge pipe 19.

The cutters 27 and the pump 29 are each driven by one of the hydraulic motors 24.

In addition, the distribution box 15 is linked to the body of the arrangement 1 by an advancing hydraulic jack 30, likewise led by one of the pumps 24.

The energy supply of the arrangement according to the invention may thus be summarized as follows:

- The primary energy, in the present case consisting of sea water under pressure, is obtained beginning from the pump 5.

This sea water under pressure is transmitted to the arrangement 1 by way of the hose 5, the injection head 7, the pipe train 2, the distribution box 13, and one of the lines of the pipe 14.
This sea water under pressure then feeds the turbine 16 by way of the distribution box 15 and the line 17, and then is evacuated, preferably over the picks of the cutters 27.

The mechanical energy produced by the turbine 16 is transmitted by way of the coupling 22 to the hydraulic plant consisting of the distribution box 23 and the pumps 24.

- The pumps 24 in turn supply energy to the hydraulic motors of the cutters 27 and the pump 29.

The guiding and locking assembly 12 is composed of a lower structure 31 and an upper structure 32, locking jaws 33 for the pipe 14 being mounted on the upper structure 32, from which they are operable by means of electric jacks 34 fed by the cable 11.

The lower structure 31 forms two assemblies of guiding surfaces 35 and 36, respectively. The guiding surfaces 35 form a reentry cone making it possible to guide the drilling arrangement 1 in a borehole already partially made when, for any reason whatever, it has had
to be withdrawn. The guiding surfaces 36 cooperate with other guiding surfaces 37 provided on the upper structure 32 to secure, in the event of such reentry, a correct repositioning between the lower structure 31 and the upper structure 32.

Drilling is effected by a reciprocating action of the jack 30 and the jaws 33, as is described in French Patent Application 85 14939.

A variety of variants and modifications may of course be made in the preceding description, without thereby exceeding the scope or the spirit of the invention.

The reference numerals in the following claims do not in any way limit the scope of the respective claims.
THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS.

1. Arrangement for underwater drilling of foundations, comprising at least one cutter (27) and one pump (29) for discharge of excavated material, and hydraulic motors for driving the said cutter and the said pump, characterized in that it comprises an hydraulic turbine (16) capable of operating with the aid of a fluid such as sea water, an hydraulic plant (23, 24) driven by the said turbine and designed for feeding the said hydraulic motors, and a head forming a first distribution box (15) for feed of the turbine and discharge of excavated material, the said head being linked by a two-line pipe (14) to a second distribution box (13), connected on the one hand to means (2) for furnishing the fluid feeding the turbine, and on the other to a hose (18) for evacuation of excavated material.

2. Arrangement according to Claim 1, characterized in that it comprises two cutters having horizontal shafts turning in reverse direction.
3. Arrangement according to either of Claims 1 and 2, characterized in that the hydraulic turbine is equipped with a discharge valve (20).

4. Arrangement according to any of Claims 1 to 3, characterized in that the discharge (21) of the turbine is directed onto the tools of the cutter.

5. Arrangement according to any of Claims 1 to 4, characterized in that the said hydraulic plant comprises a plurality of hydraulic pumps (24) driven by the said turbine by way of a mechanical distribution box (23).

6. Arrangement according to any of Claims 1 to 5, characterized in that the said head is fixed to the body of the arrangement by at least one advancing jack (30) fed by the said hydraulic plant.
7. An arrangement for underwater drilling of foundation substantially as hereinbefore described with reference to the drawings.

8. The steps or features disclosed herein or any combination thereof.

Dated this 8th day of July, 1987

SOLETANCHE
By its Patent Attorneys
DAVIES & COLLISON