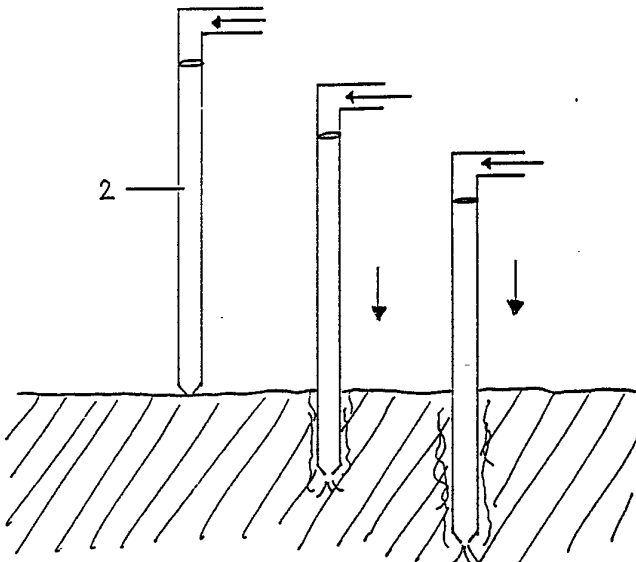




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(21) International Application Number: PCT/DK92/00011 (22) International Filing Date: 14 January 1992 (14.01.92) (30) Priority data: 63/91 14 January 1991 (14.01.91) DK (71)(72) Applicant and Inventor: PETERSEN, Frede, Andresen [DK/DK]; Drosselvænget 7, DK-6310 Broager (DK). (74) Agent: K. SKØTT-JENSEN PATENTINGENIØRER A/S; Lemmingvej 225, DK-8361 Hasselager (DK). (81) Designated States: AT, AT (European patent), AU, BB, BE (European patent), BF (OAPI patent), BG, BJ (OAPI patent), BR, CA, CF (OAPI patent), CG (OAPI patent), CH, CH (European patent), CI (OAPI patent), CM (OAPI patent), CS, DE, DE (European patent), DK, DK (European patent), ES, ES (European patent), FI, FR (European patent), GA (OAPI patent), GB, GB (European patent), GN (OAPI patent), GR (European patent), HU, IT (European patent), JP, KP, KR, LK, LU, LU (European patent), MC (European patent), MG, ML (OAPI patent),		MN, MR (OAPI patent), MW, NL, NL (European patent), NO, PL, RO, RU, SD, SE, SE (European patent), SN (OAPI patent), TD (OAPI patent), TG (OAPI patent), US. Published <i>With international search report.</i> <i>In English translation (filed in Danish).</i>
(54) Title: METHOD AND EQUIPMENT FOR WORKING DOWN AND TAKING UP LIGHT POLES AND FOR BUILDING LIGHT BRIDGES <div style="text-align: center;">  </div> (57) Abstract For the working down of light poles, e.g. for light bridges, use is made of tubular poles (2), which are mounted by the flush-down method, whereby, however, use is not made of auxiliary flushing spears, but of the single tubular poles (2) as a self-contained permanent flushing spear. Correspondingly the poles are easy to take up, by introduction of compressed air therein. The mounting work is facilitated to the degree that light bridges can now be erected by a single operator, making use of an additionally disclosed method.		

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Method and equipment for working down and taking up light poles and for building light bridges.

The present invention relates to a method of establishing light bridges or platforms that are carried by metal pipes mounted in the ground or in the beach bottom. Relatively thin pipes are easier to mount in the ground than the thicker wooden posts which have been used traditionally, regardless of the mounting being effected by ramming or flushing, and with a good mounting depth of e.g. 1.5 - 3 m an excellent side stability is achievable. Upon their mounting the pipe poles may be utilized in a simple and standardized manner, i.e. with the use of standard components, for the further mounting of associated bridge elements. When suitably corrosion protected, e.g. in case of galvanized iron pipes, these poles may also exhibit a comparatively long lifetime.

According to a preferred manner of mounting the poles use is made of the said flushing down, whereby a flushing spear is used for easing the pole down into the ground, pressurized water being sent out through the lower end of the spear. The spear, which is usable for flushing down both pipe poles and wooden poles, is moved into the ground together with the pole, only with the spear point located slightly beneath the lower end of the pole, such that the material underneath the pole end is currently flushed away so as to condition a particularly easy and rapid working down of the pole.

In connection with the present invention it has been recognized that this type of mounting can be effected in a still simpler manner, namely in making use of the pipe poles themselves as permanent or remaining flushing spears. The pressure of the current of flushing water is not required to be particularly high, so it is very easy to arrange for the coupling on and off of a

pump hose at the top of the single pipe poles. When the delivery of the flushing water takes place through the lower pole end the placing of the 'spear end' will automatically be correct, and the flushing down of the pole, therefore, can easily be effected by a single operator, even without the operator being particularly skilled.

Correspondingly, it is a very advantageous possibility that the poles may be taken up by utilizing their upper connector ends for connection with a hose supplied with compressed air, as it is then possible to take up the otherwise rigidly mounted poles with a minimum of labour and equipment, such that the bridge may be taken in for the winter and reestablished by spring in a rather easy manner. It is already known that by means of permanently bottom mounted socket members it is possible to achieve an easy take up and remounting of the poles, but in accordance with the invention this work may be done practically as easily, without the costs of the system being increased by virtue of the special bottom sockets.

By the taking up of poles it is normally a special problem that a straight pulling up results in a vacuum beneath the lower end of the pole, but with the said use of compressed air or for that sake pressurized water it is possible to press out such bottom material which might have intruded into the lower pipe mouth and thereafter to effect a relief of the vacuum constantly during the pulling up of the pole. The pressure medium, whether it is air or water, will thus facilitate both the working down and the taking up of the poles, as the actual movement, then, will be conditioned only by the pole being influenced by a downwardly or an upwardly directed force, respectively. However, for the working down the pressurized water will be the most effective medium, while the compressed air will be more suitable for the taking up, because the flushing effect will be less

pronounced, whereby the pressure upwardly will be increased.

For flushing down the pipe poles to a depth of down to 1.5 m it will normally be sufficient that the lower pipe end is terminated by a simple transverse cutting, while for lower depths it can be advantageous to make use of a nozzle like narrowing of the lower pipe end in order to obtain an increased velocity of the water flow in the outlet area. When the water is expelled directly downwardly the pole will start carrying out beat movements when a certain depth has been reached, normally about one meter, and such beating will contribute to a rapid working down.

When thus both the mounting and the dismounting of the poles can be done by a single person it will be advantageous, according to the invention, when also the remaining mounting or dismounting of the bridge can be effected by a single person in a simple manner, viz. with the use of an auxiliary crane that is mountable on the front end of the already erected bridge portion for reception of a prefabricated bridge element; the latter may then be used as a working platform for the working down of further poles and then be secured to these poles, respectively for the taking up of the poles and a successive dismounting of the bridge.

In the following the invention is described in more detail with reference to the drawing, in which:

Fig. 1 is a schematic view illustrating the working down of pipe poles by flushing,

Fig. 2 a)-e) are lateral views of different designs of the lower end of the poles,

Figs. 3-6 illustrate the successive erection of a bridge with the use of an auxiliary crane, and

Figs. 7-9 illustrate different pole founded constructions.

Fig. 1 illustrates a sea bottom, in which a tubular

pole 2 is flushed down by means of an upper connection hose 4 to a water pump (not shown), which may well be a centrifugal pump, as the required pressure is not particularly high. After the flushing down the bottom material will pack around the pole, which will then be able to stand in a stable manner when the depth of the flushing down is reasonably large; with the use of pipes of a diameter of 2-3 inches the depth should of course somewhat larger than in case of thick wooden poles, typically of the magnitude 1-3 m.

In fig. 2 is shown such a pipe pole 2, the upper end of which is connected with the hose 4 by means of a suitable connector 6. At its lower end the pipe 2 is terminated by simple cutting, which will provide for a sufficient flushing effect for poles that should only be driven down to a depth of some 1.5 m, of course depending of the type of the bottom material. For larger depths it is recommendable to utilize a stronger flushing effect, which will not necessarily require a stronger pump, as it is obtainable merely by using a narrower nozzle opening 8 on the pipe pole 2, as shown in Fig. 2b. This opening may even be supplemented by an annular row of outwardly and downwardly directed nozzle openings 10 as shown in fig. 2c; it has been found that poles with such a design are suitable for driving down to the depth range of 1.5 - 2.5 m.

With the use of the downwardly directed nozzle openings the phenomenon will occur that the pipe, upon a certain intrusion into the ground, starts to carry out vertical beat movements, which will promote the driving down. When large mounting depths are required, e.g. more than 2.5 m, pipe poles can be used, which, as shown in Figs. 2d and 2e, have a lower funnel shaped end member 12 that is vertically reciprocal on an axial guiding rod 14 relatively to the lower rigid end of the pole; hereby the said beat movements will occur in a more firm manner

between the pipe pole 2 and the funnel member 12, this resulting in a still harder beat effect that is advantageous when the pole is driven down to a depth larger than e.g. 2.5 m.

Fig. 3 illustrates an initial building out of a bridge, by which it has been possible from the shore side to flush down the first set of pipe poles 2 for receiving a first, preferably prefabricated bridge element 16, which is fastenable to the upstanding poles by the use of any suitable type of fastening fittings. As indicated, the pole 2 may carry a horizontal bottom support plate 18 that will stabilize the pole against tilting and thus reduce the need of a deep intrusion of the pole in the ground.

Thereafter, as shown in Fig. 4, a crane 20 may be mounted on the fixed bridge element 16, the crane having a jig 22 that is usable for carrying a further bridge element 16', which, as shown in Fig. 5, may be outwardly displaced into a suspended position adjacent the end of the bridge, in which position this element may be used as a working platform for the flushing down of an additional pair of pipe poles 24 by means of a water pump 26 sucking water from the lake or sea water. Once these further poles are mounted the bridge element 16' can be secured thereto, still from above and by the labour of but a single operator, and thereafter the bridge can be built further out with the use of more bridge elements as shown in Fig. 6.

For a taking in of the bridge an inverted procedure may be followed, now in lieu of the water pump using an air compressor, which is connected to the first of the outermost poles, the crane hereby being mounted on the second outermost bridge element and being brought into carrier connection with the outermost bridge element, whereafter the poles are drawn or blown up after being released from the bridge element. The outermost bridge

element may then be brought in together with the poles, and then the crane is displaced one element inwardly for dismounting of the next bridge element.

As indicated in the figures the pipe poles may be provided with a horizontal support plate 28 at a place corresponding to the desired intrusion depth, this place in advance being measured out relative to the actual vertical distance down to the bottom. Correspondingly, each of the poles may be adapted such that they will all project equally high, once mounted. The plates 28 will act as foot plates, which, by their engagement with the ground bottom, will form a well defined flushing down stop and also act laterally stabilizing on the poles.

The invention is relevant for all kinds of mounting of light poles, also on the land, e.g. for the mounting of fence or hand rail poles, or for the founding of terrace floors on swampy or inclined areas. Even pole mounting for coast protection can be relevant. Figs. 7-9 show some examples of off-shore application, viz. a 'sea summer house', supported on vertical poles, a platform supported by inclined poles that are flushed down in a star pattern, and a sea pond farm with hanging nets, respectively. Also, the invention may be used in connection with a known arrangement, whereby there is mounted on the bottom a socket element for guided, releasable reception of an upstanding pole element, such that upon the first mounting thereof it will be easy to take up and remount before and after the winter season, respectively; the socket element may have one or more depending anchor spears that are originally flushed down in accordance with the invention. It should be mentioned, however, that this possibility is not necessarily more attractive than the disclosed working down and taking up of the poles or spears as a whole, because this work will be very easy to carry out and will not require any potentially difficult refinding of the

socket elements.

Generally, instead of a single pipe pole of any suitable material, it will be possible to use more, closely juxtaposed poles for concurrent flushing down. It may even be possible to co-flush-down a solid pole, for which the associated flushing pole or poles will act as flush down spears. These 'permanent spears' will be of importance not only for the strength of the pole, but also because the solid pole portions will be quite easy to co-dismount by the said pressing up of the poles. This aspect has the further perspective that it is possible to use solid poles or for that sake thick tubular poles which can be flushed down with the use of one or more flushing pipes or even hoses. Hereby even rather thick poles can be handled, when they are provided with a relatively thin flushing conduit ending at the bottom area of the pole.

It has been mentioned that preferably light constructions and poles are involved, but the invention is not restricted to any special dimensions to the extent it will be applicable in an advantageous manner in some relevant situation.

C L A I M S :

1. A method of establishing light bridges, platforms or hand rails that are carried by poles mounted in the ground or the sea bottom, characterized by the combination of using as poles pipe poles of metal or another suitable material, mounting these poles by using the flushing down principle, and hereby using the pipe poles themselves as flushing pipes, each pole, upon the flushing down thereof, being disconnected from the applied flushing source, which is then connected with the next pole to be mounted.

2. A method according to claim 1, characterized by the use of pipe poles, the lower ends of which are designed particularly for promoting the flush-down function, e.g. with a narrowed nozzle opening.

3. A method according to claim 1, characterized in that for a subsequent taking up of the pipe poles the upper ends of the poles are connected to a source of compressed air or pressurized water.

4. A method according to claim 1, characterized in that for establishing a local carrier area several pipe poles are flushed down in a star pattern, in positions outwardly and downwardly inclined, and their upper ends being joined for forming the carrier area.

5. A method according to claim 1, characterized in flushing down pipe poles that are prepared with foot plates for limiting the depth of the flushing down.

6. A method according to claim 1, characterized in that for the erection of a bridge there is used a working platform for the flushing down of the pipe poles for a bridge element to be added, the platform being constituted by just that element itself, the element being suspended in a crane jig secured to the hitherto outermost and already mounted bridge element.

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FIG. 1

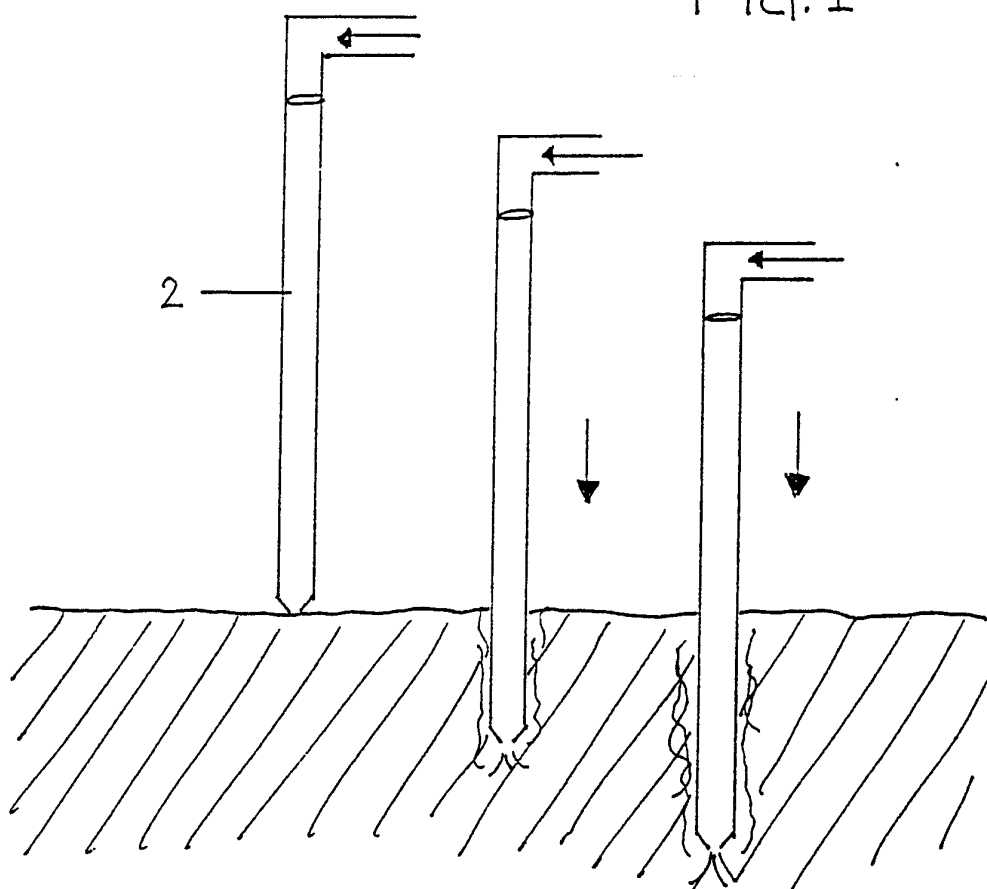
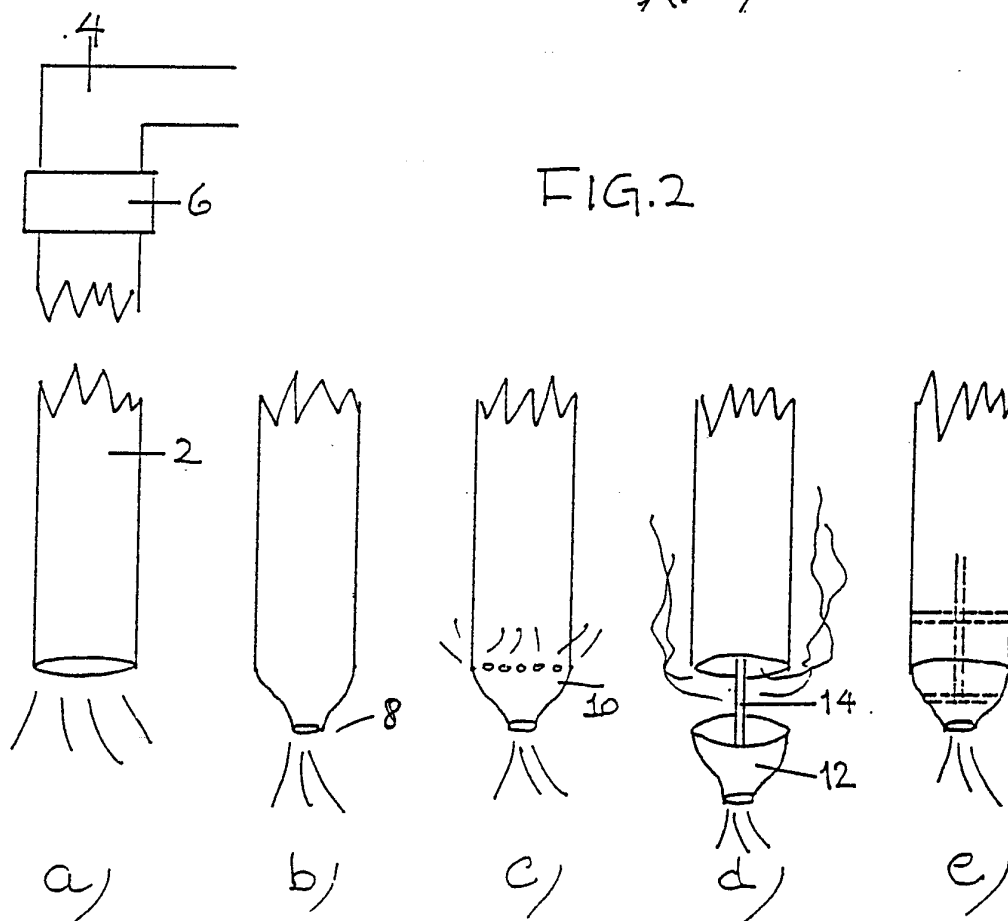
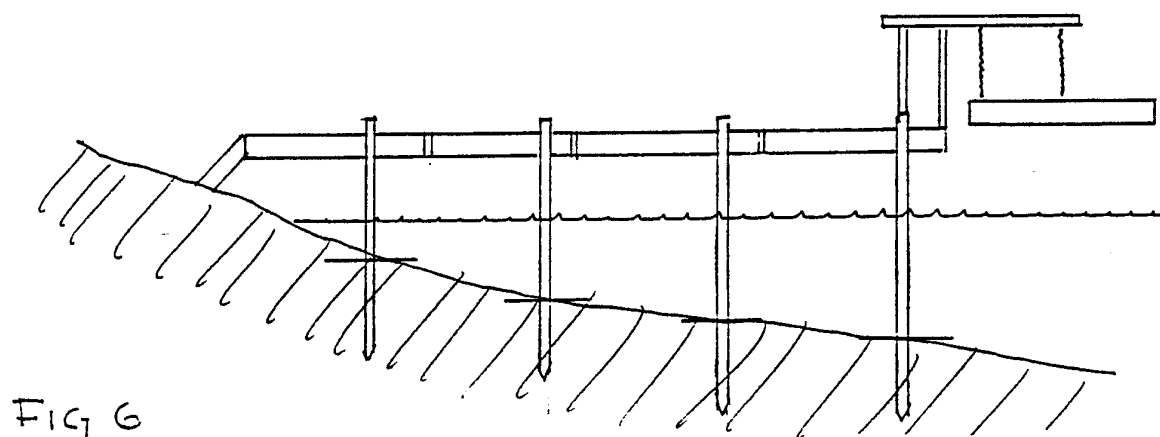
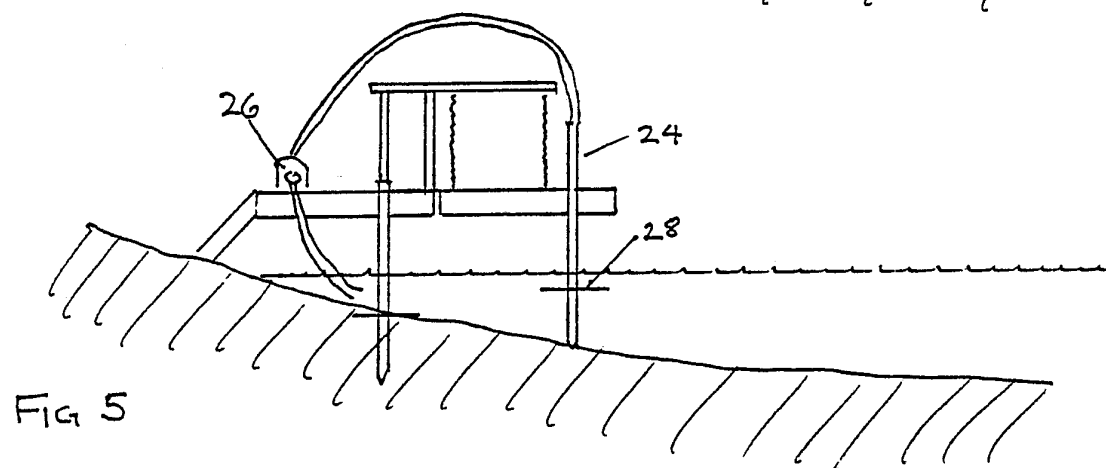
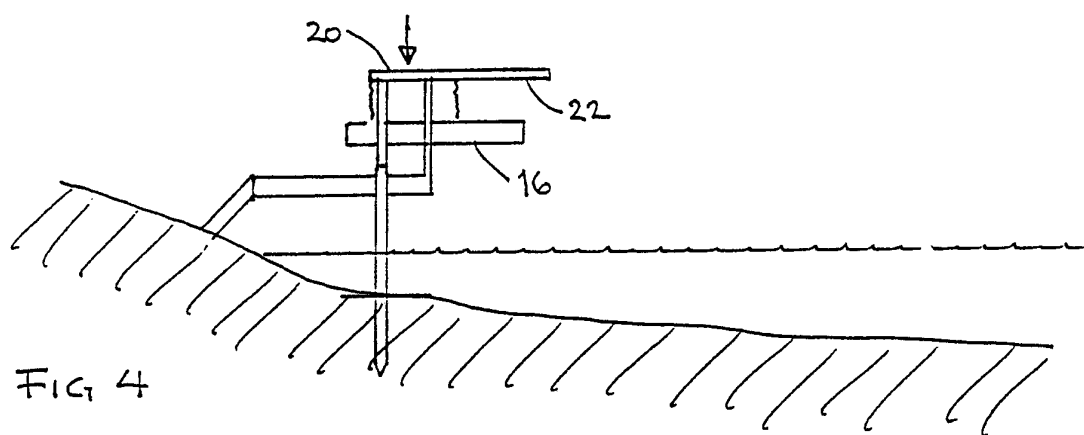
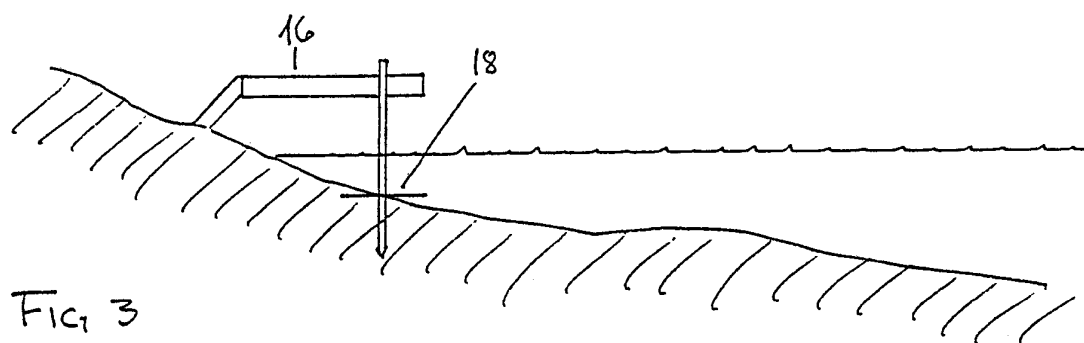
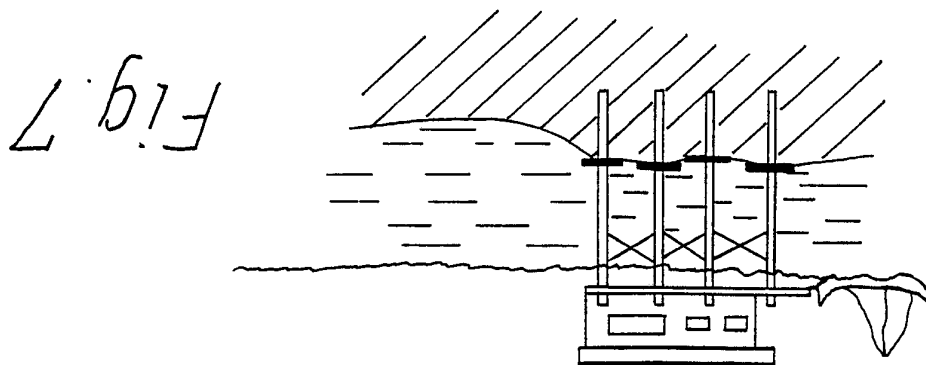
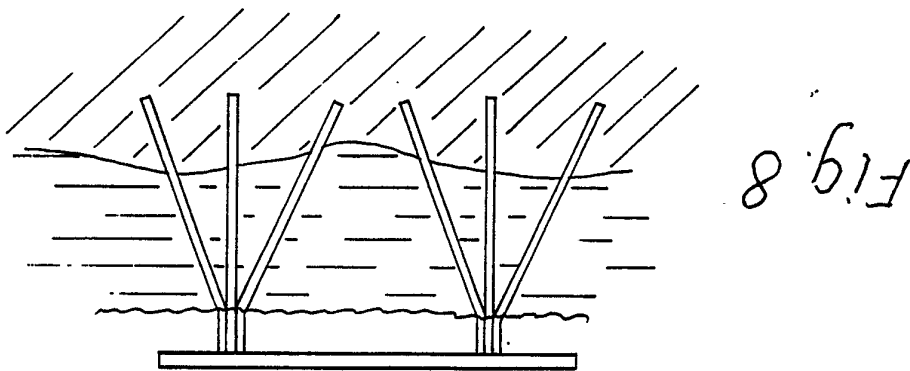
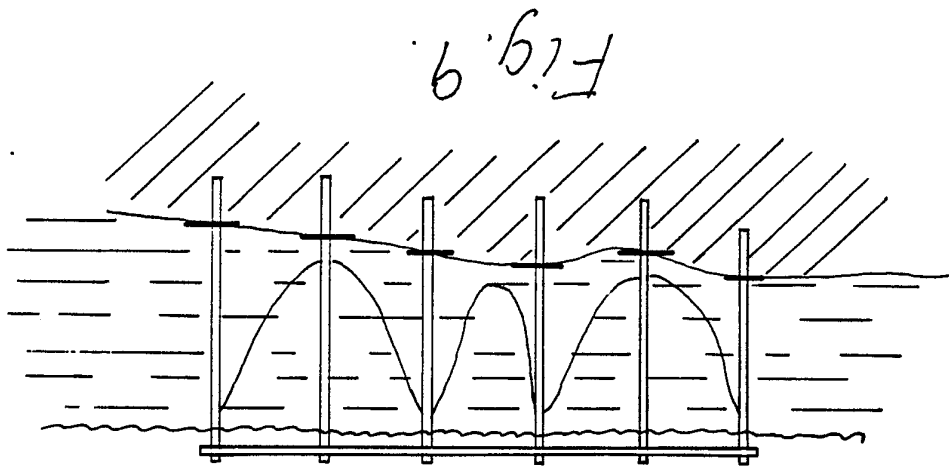


FIG. 2



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INTERNATIONAL SEARCH REPORT

International Application No PCT/DK 92/00011

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) ⁶ According to International Patent Classification (IPC) or to both National Classification and IPC IPC5: E 01 D 1/00, E 02 D 7/24																	
II. FIELDS SEARCHED <div style="text-align: center; margin-top: 5px;">Minimum Documentation Searched⁷</div> <table style="width: 100%; border: none;"> <tr> <td style="width: 25%; border: none; vertical-align: top;">Classification System</td> <td style="border: none; vertical-align: top;">Classification Symbols</td> </tr> <tr> <td style="border: none; height: 40px; vertical-align: bottom;">IPC5</td> <td style="border: none; vertical-align: bottom;">E 01 D; E 02 D</td> </tr> </table> <div style="text-align: center; margin-top: 5px;">Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched⁸</div> <div style="padding: 5px; margin-top: 10px;">SE,DK,FI,NO classes as above</div>			Classification System	Classification Symbols	IPC5	E 01 D; E 02 D											
Classification System	Classification Symbols																
IPC5	E 01 D; E 02 D																
III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹ <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <thead> <tr> <th style="width: 10%;">Category *</th> <th style="width: 60%;">Citation of Document,¹¹ with indication, where appropriate, of the relevant passages¹²</th> <th style="width: 30%;">Relevant to Claim No.¹³</th> </tr> </thead> <tbody> <tr> <td style="text-align: center; vertical-align: top;">X</td> <td>DE, C1, 512785 (LANG, F.W.) 17 November 1930, see the whole document --</td> <td style="text-align: center; vertical-align: top;">1-3,7</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">X</td> <td>DE, A1, 3726472 (DYCKERHOFF & WIDMANN AG) 16 February 1989, see column 4, line 47 - column 5, line 11; figures 1,5 --</td> <td style="text-align: center; vertical-align: top;">1,2,7</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">X</td> <td>GB, A, 398354 (TAYLOR, W.) 14 September 1933, see page 2, line 26 - line 84; figures 1-5 --</td> <td style="text-align: center; vertical-align: top;">1-3,7</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">X</td> <td>US, A, 4257722 (NAKAJIMA, H.) 24 March 1981, see column 4, line 29 - line 45; figures 1,4 --</td> <td style="text-align: center; vertical-align: top;">1,7</td> </tr> </tbody> </table>			Category *	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³	X	DE, C1, 512785 (LANG, F.W.) 17 November 1930, see the whole document --	1-3,7	X	DE, A1, 3726472 (DYCKERHOFF & WIDMANN AG) 16 February 1989, see column 4, line 47 - column 5, line 11; figures 1,5 --	1,2,7	X	GB, A, 398354 (TAYLOR, W.) 14 September 1933, see page 2, line 26 - line 84; figures 1-5 --	1-3,7	X	US, A, 4257722 (NAKAJIMA, H.) 24 March 1981, see column 4, line 29 - line 45; figures 1,4 --	1,7
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X	US, A, 4257722 (NAKAJIMA, H.) 24 March 1981, see column 4, line 29 - line 45; figures 1,4 --	1,7															
<div style="display: flex; justify-content: space-between;"> <div style="width: 48%;"> <p>* Special categories of cited documents:¹⁰</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 48%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&" document member of the same patent family</p> </div> </div>																	
IV. CERTIFICATION <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none; vertical-align: top;"> Date of the Actual Completion of the International Search 26th March 1992 </td> <td style="width: 50%; border: none; vertical-align: top;"> Date of Mailing of this International Search Report 1992 -03- 27 </td> </tr> <tr> <td style="border: none; vertical-align: top;"> International Searching Authority <div style="text-align: center; margin-top: 20px;">SWEDISH PATENT OFFICE</div> </td> <td style="border: none; vertical-align: top;"> Signature of Authorized Officer Ingemar Hedlund </td> </tr> </table>			Date of the Actual Completion of the International Search 26th March 1992	Date of Mailing of this International Search Report 1992 -03- 27	International Searching Authority <div style="text-align: center; margin-top: 20px;">SWEDISH PATENT OFFICE</div>	Signature of Authorized Officer Ingemar Hedlund											
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III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
X	US, A, 4637758 (TAMAKI ET AL) 20 January 1987, see column 3, line 17 - line 34; figure 1 --	1,2,7
X	US, A, 4761096 (LIN, S.S.) 2 August 1988, see the whole document --	1-3,7
X	Patent Abstracts of Japan, Vol 10, No 92, M468, abstract of JP 60-230430, publ 1985-11-15 (KINJI KUWABARA) -- -----	1,2,7

**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO. PCT/DK 92/00011**

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
The members are as contained in the Swedish Patent Office EDP file on 28/02/92
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-C1- 512785	30-11-17	NONE	
DE-A1- 3726472	89-02-16	NONE	
GB-A- 398354	33-09-14	NONE	
US-A- 4257722	81-03-24	DE-A-C- 2913433	79-10-18
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		GB-A-B- 2022660	79-12-19
		JP-C- 1124662	82-11-30
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		NL-A- 7902690	79-10-09
US-A- 4637758	87-01-20	US-A- 4494613	85-01-22
US-A- 4761096	88-08-02	NONE	