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(54) **Oil separation and pumping systems**

(57) The present invention relates to an arrangement for separating liquids of different densities in a well bore (34), particularly for producing a hydrocarbon-rich stream from a well (20) having a hydrocarbon producing zone (24) and spaced therefrom along the well (20) a disposal zone (26) for disposing a water-rich stream without transporting it to the surface, wherein the disposal zone (26) is an downhole disposal zone. The arrangement comprises a well bore (34) penetrating the hydrocarbon producing zone (24) and the disposal zone (26) in the earth (22), at least one packer (580) disposed in the well bore (34) between the producing zone (24) and the disposal zone (26), a tubing (36) extending from the surface and an assembly coupled to the tubing (36). The assembly comprises a motor (582), a pump (586) coupled to the motor (582) and being in fluid communication with the producing zone (24), and a multiple stage hydrocyclone having an inlet (596), a hydrocarbon-rich stream outlet in fluid communication with the tubing (36, 604) and a water-rich stream outlet in fluid communication with the disposal zone (26). The pump (586) is disposed in the assembly to direct the flow of liquid from the producing zone (24) into contact with the motor (582) and to the inlet of the separator. The assembly further comprises a first separator (590) having an inlet in fluid communication with the production zone (24), a hydrocarbon-rich stream outlet in fluid communication with the tubing (36, 604) extending from the surface and a water-rich stream outlet, and a second separator (592) having an inlet (612) in fluid communication with the wa-

ter-rich stream outlet of the first separator (590), a hydrocarbon-rich stream outlet (594) in fluid communication with the pump inlet (588) and a water rich stream outlet in fluid communication with the disposal zone (26).

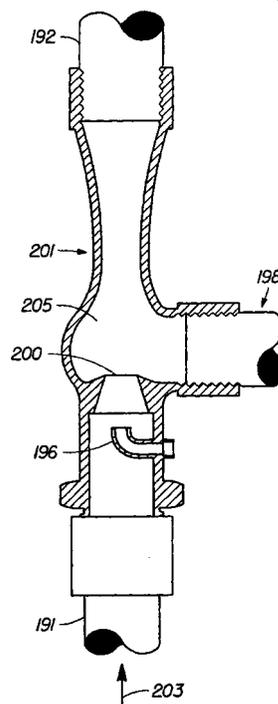


FIG. 21



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 04 00 8544

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
X	US 5 456 837 A (PEACHEY BRUCE R) 10 October 1995 (1995-10-10) * column 5, line 4 - line 53; figure 5 * Claim 1 lacks an inventive step with regard to this document considered alone ---	1
A	US 4 738 779 A (PRENDERGAST GAVAN J J ET AL) 19 April 1988 (1988-04-19) * figure 3 * -----	1
The present search report has been drawn up for all claims		
Place of search		Examiner
MUNICH		Tompouloglou, C
Date of completion of the search		
19 July 2004		
<p>TECHNICAL FIELDS SEARCHED (Int.Cl.7)</p> <p>E21B</p>		
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>		

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82